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(71) 出願人(米国を除くすべての指定国について)
富士通株式会社 (FUJITSU LIMITED)〔JP/JP〕
〒211 神奈川県川崎市中原区上小田中1015番地 Kanagawa, (JP)
(72) 発明者;および
(75) 発明者/出願人(米国についてのみ)
日吉 豊(HIYOSHI, Yutaka)〔JP/JP〕
小川裕一(OGAWA, Yuiti)〔JP/JP〕
〒222 神奈川県横浜市港北区新横浜2丁目4番19 富士火災ビル
株式会社富士通プログラム技研内 Kanagawa, (JP)
田中浩幸(TANAKA, Hiroyuki)〔JP/JP〕
〒999-37 山形県東根市大字東根元東根字大森5400番2
株式会社山形富士通内 Yamagata, (JP)
袴谷隆夫(HAKAMATANI, Takao)〔JP/JP〕
郡川昌幸(KORIKAWA, Masayuki)〔JP/JP〕
鶴見浩司(TSURUMI, Hiroshi)〔JP/JP〕
工藤哲郎(KUDO, Tetsuro)〔JP/JP〕
〒211 神奈川県川崎市中原区上小田中1015番地 富士通株式会社内
Kanagawa, (JP)
(74) 代理人
弁理士 宇井正一, 外(UI, Shoichi et al.)
〒105 東京都港区虎ノ門一丁目8番10号 静光虎ノ門ビル
青和特許法律事務所 Tokyo, (JP)

(81) 指定国
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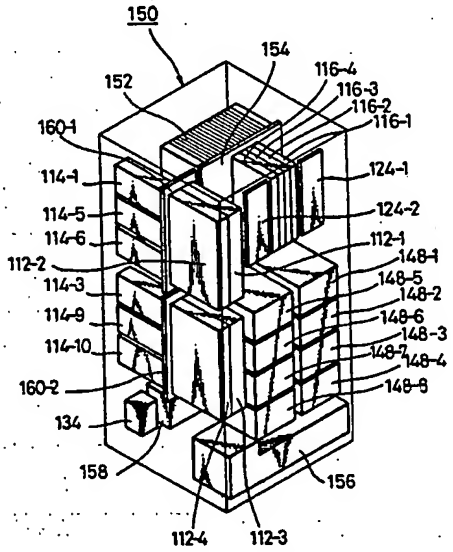
添付公開書類 国際調査報告書

(54) Title : MAGNETIC DISK DEVICE

(54) 発明の名称 磁気ディスク装置



(57) Abstract

A magnetic disk device used as a subsystem of a computer system, particularly of a medium-size computer system which uses the commercial power source, but not provided with its own backup power source. The device comprises a plurality of directors (118); a plurality of magnetic disk modules (148) accessible in common by the plural directors; a plurality of batteries (114-m) for supplying power individually to the plural directors; batteries (114-n) for supplying power to the magnetic disk modules; and a power controller (110) which controls individually the power supplies from the plural batteries for the directors and the batteries for the magnetic disk modules in accordance with the operational conditions of the directors and modules.

(57) 要約

本発明は、コンピュータシステム、特に商用電源を使用し自身にバックアップ用電源を持たない中型コンピュータシステムのサブシステムとして使用する磁気ディスク装置であって、複数のディレクタ(118)と、該複数のディレクタから共通にアクセスされる複数の磁気ディスク・モジュール(148)と、該複数のディレクタにそれぞれ別個に電力を供給する複数のディレクタ用バッテリー(114－m)と、前記磁気ディスク・モジュールに電力を供給する磁気ディスク・モジュール用バッテリー(114－n)と、前記複数のディレクタ用バッテリー及び磁気ディスク・モジュール用バッテリーからの電力供給を、前記複数のディレクタ及び磁気ディスク・モジュールの動作状態に応じて、独立して供給制御するパワーコントローラー(110)とを備えて構成される。(図1)。

Fig.1

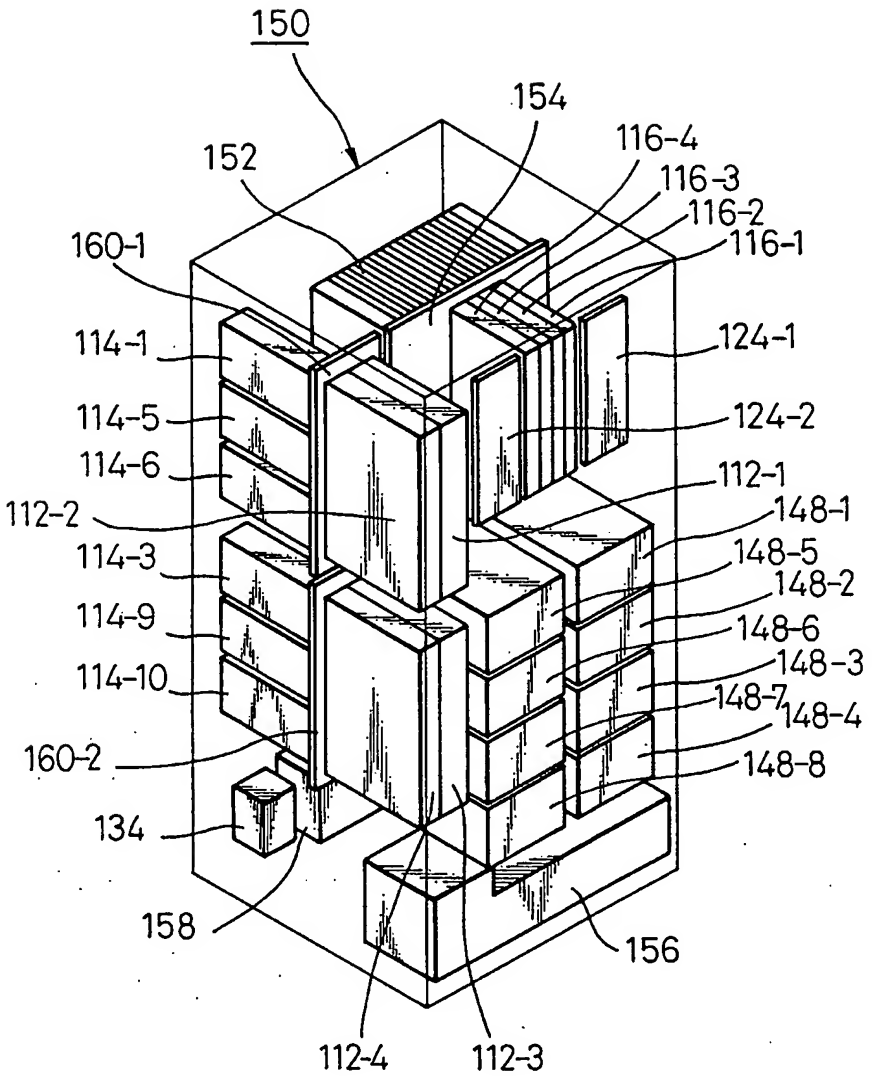

150
154
152
116-4
116-3
116-2
116-1
160-1
114-1
124-1
114-5
124-2
114-6
112-1
112-2
148-1
114-3
148-5
148-2
114-9
148-6
148-3
114-10
148-7
148-4
160-2
148-8
134
158
156
112-4
112-3

Fig. 2

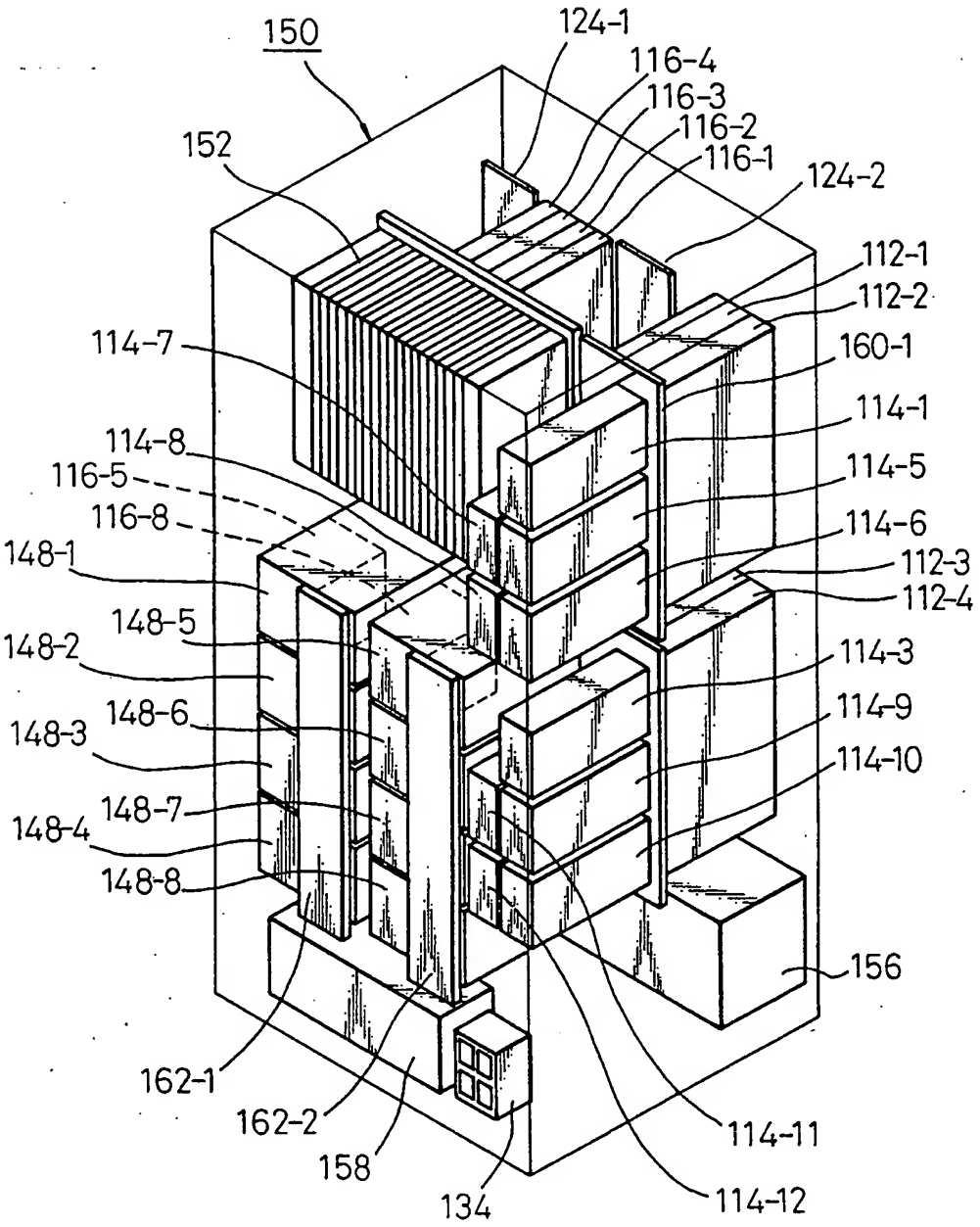

150
124-1
116-4
116-3
116-2
116-1
124-2
152
112-1
112-2
160-1
114-7
114-1
114-8
114-5
116-5
116-8
114-6
148-1
112-3
112-4
148-5
148-2
114-3
114-9
148-6
148-3
114-10
148-7
148-4
148-8
156
162-1
162-2
158
134
114-11
114-12

Fig.3

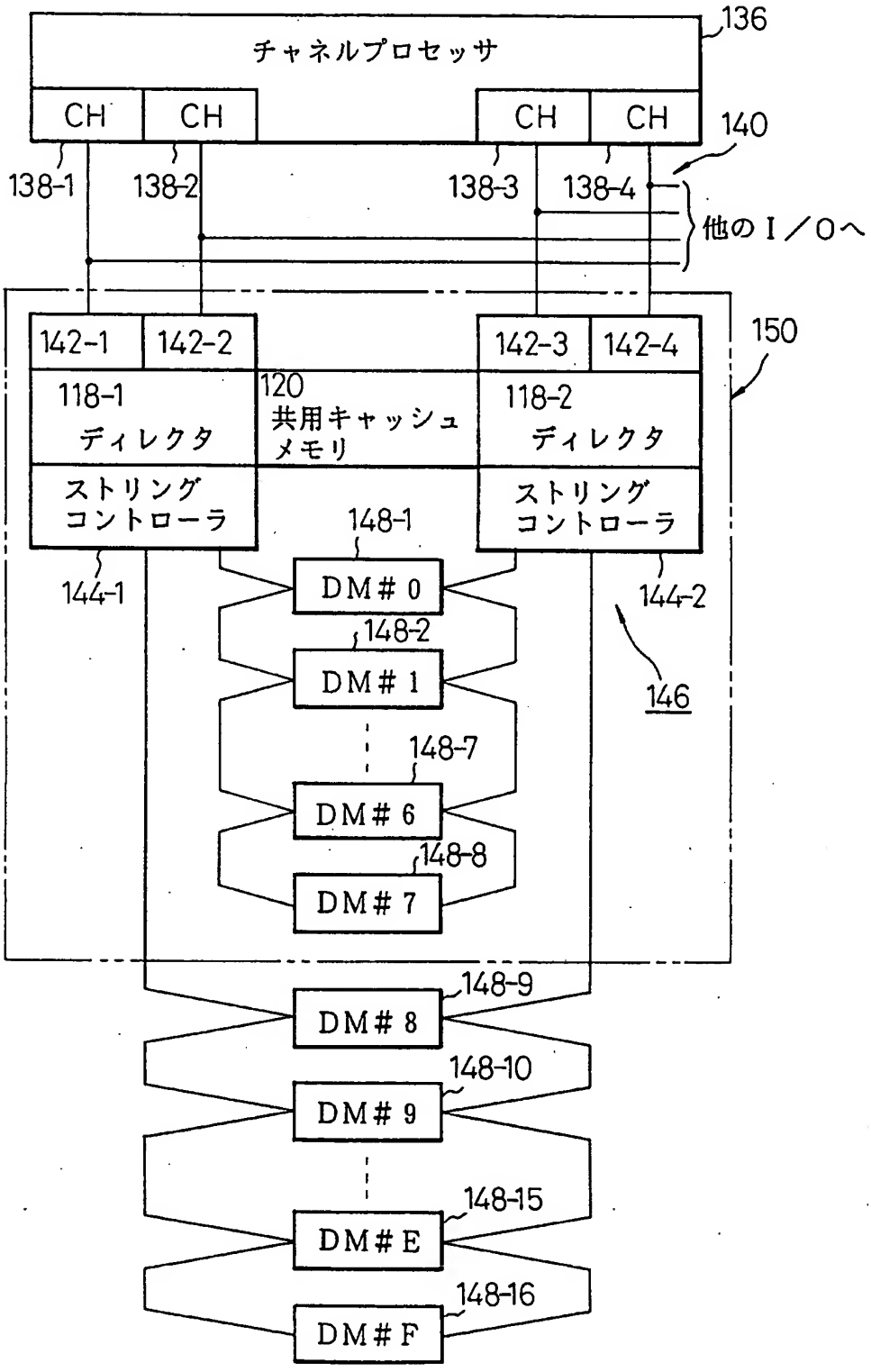

チャネルプロセッサ
136
CH
CH
CH
CH
140
138-1
138-2
138-3
138-4
他のI／Oへ
150
142-1
142-2
142-3
142-4
118-1
ディレクタ
120
共用キャッシュ
メモリ
118-2
ディレクタ
ストリング
コントローラ
ストリング
コントローラ
148-1
144-1
144-2
DM# 0
148-2
DM# 1
146
148-7
DM# 6
148-8
DM# 7
148-9
DM# 8
148-10
DM# 9
148-15
DM# E
148-16
DM# F

Fig.4A
Fig.4B

Fig.4

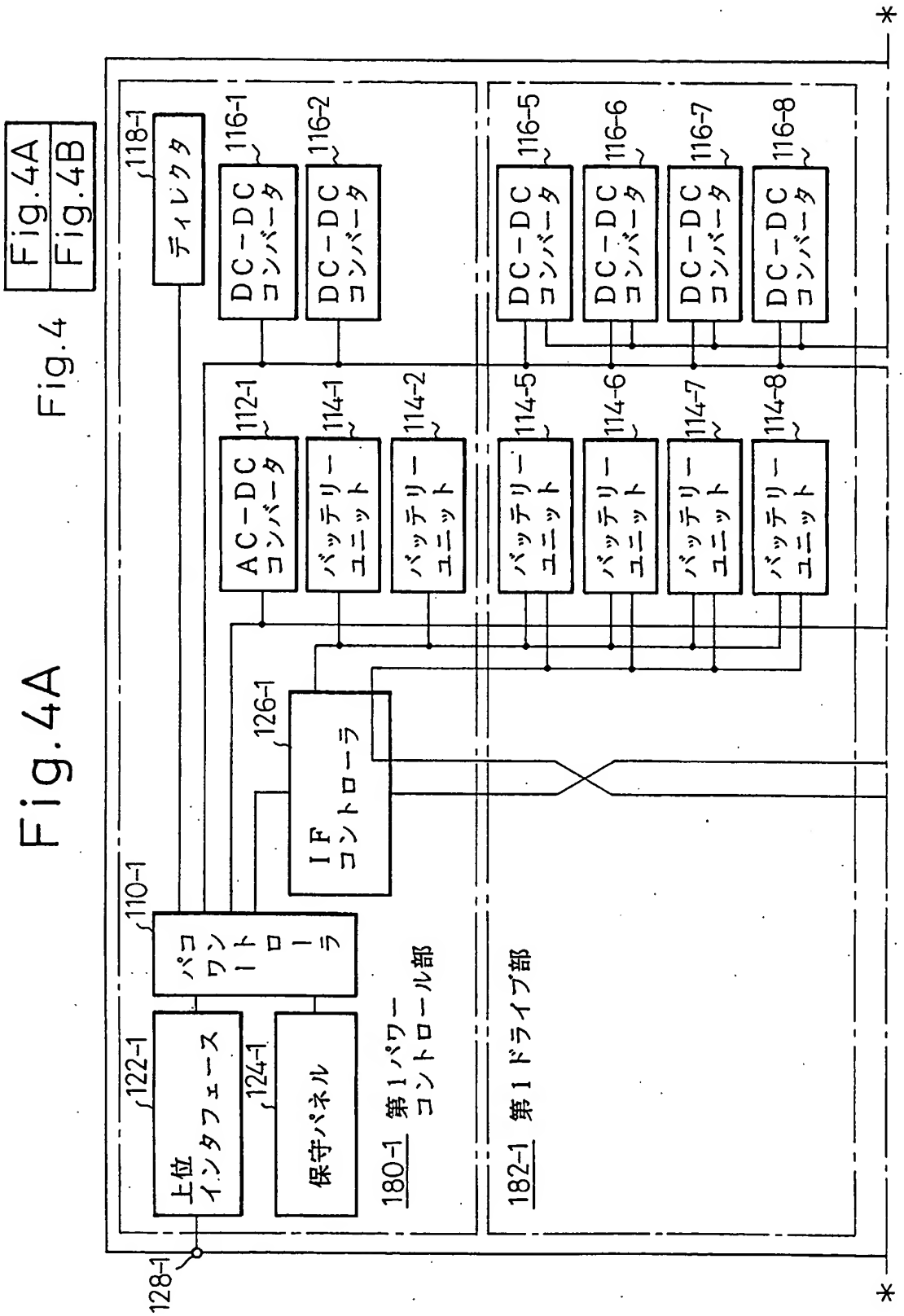


Fig. 4B

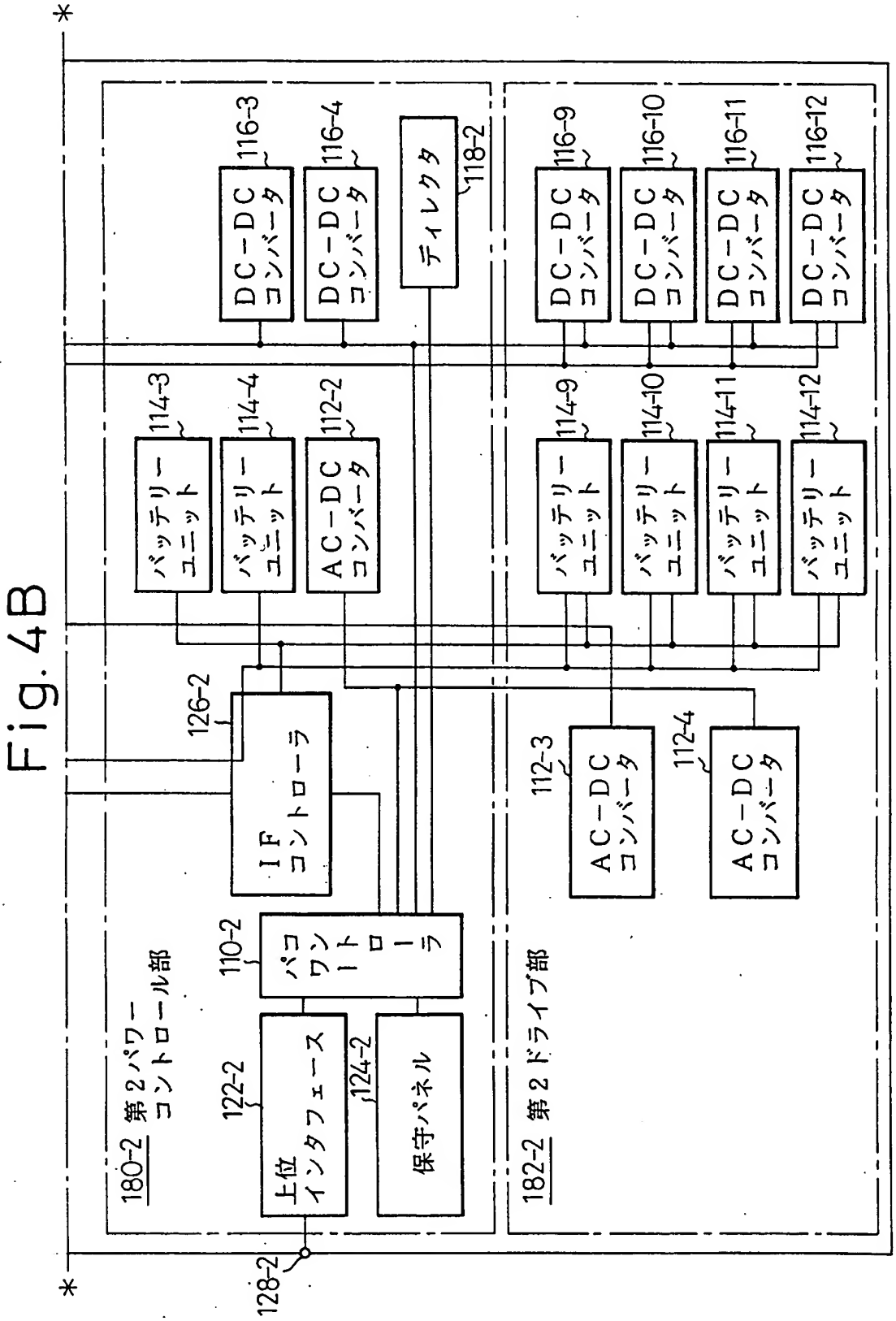

180-2 第2パワーコントロール部
182-2 第2ドライブ部
128-2
122-2
上位インタフェース
124-2
保守パネル
110-2
パコンコントローラ
126-2
IFコントローラ
112-2
AC-DCコンバータ
112-3
AC-DCコンバータ
112-4
AC-DCコンバータ
114-3
バッテリーユニット
114-4
バッテリーユニット
114-9
バッテリーユニット
114-10
バッテリーユニット
114-11
バッテリーユニット
114-12
バッテリーユニット
116-3
DC-DCコンバータ
116-4
DC-DCコンバータ
116-9
DC-DCコンバータ
116-10
DC-DCコンバータ
116-11
DC-DCコンバータ
116-12
DC-DCコンバータ
118-2
ディレクタ

Fig.5

Fig.5A
Fig.5B

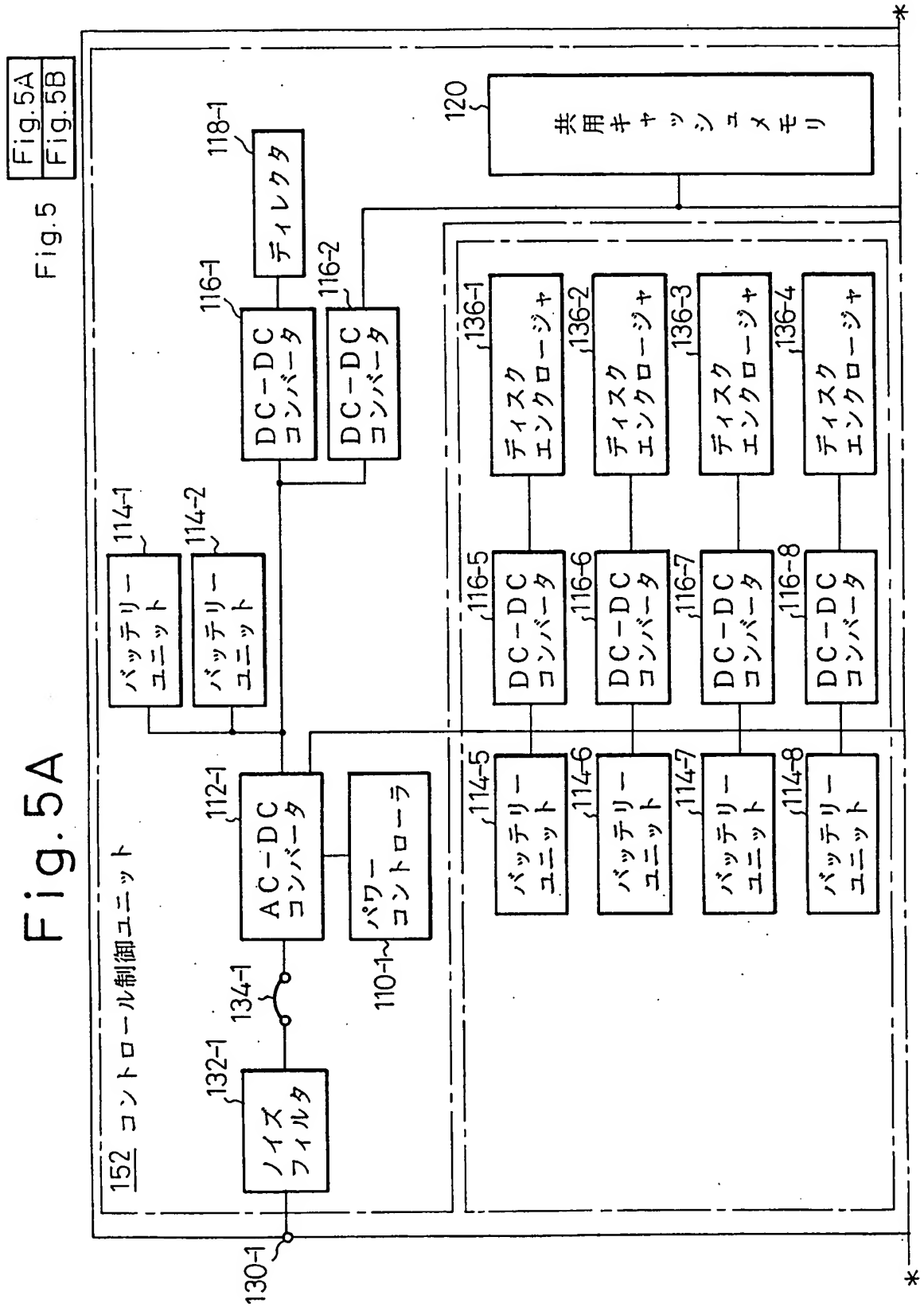


Fig. 5B

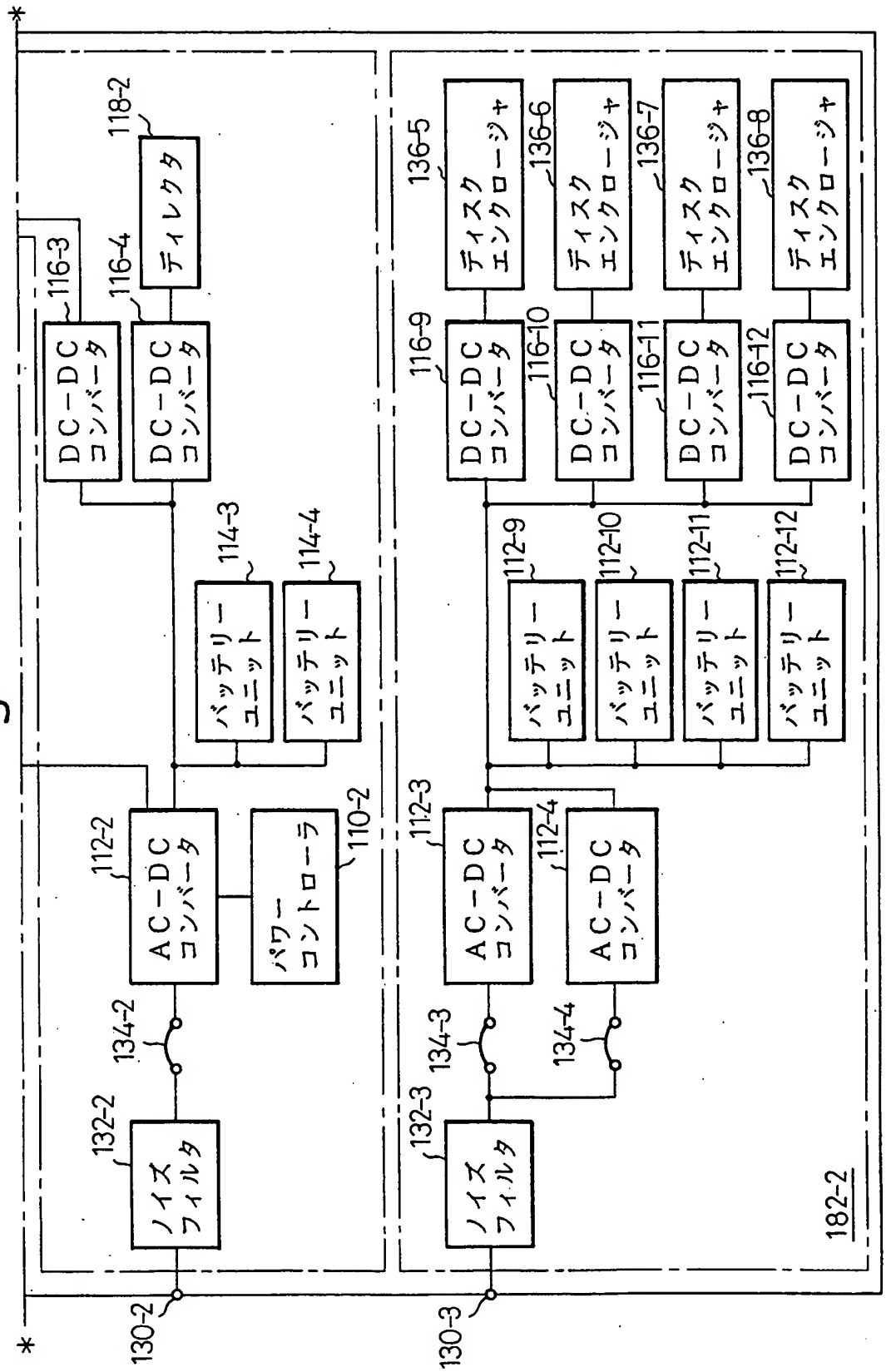

*
*
130-2
130-3
182-2
ノイズフィルタ
132-2
ノイズフィルタ
132-3
134-2
134-3
134-4
AC-DCコンバータ
112-2
AC-DCコンバータ
112-3
AC-DCコンバータ
112-4
パワーコントローラ
110-2
バッテリーユニット
114-3
バッテリーユニット
114-4
バッテリーユニット
112-9
バッテリーユニット
112-10
バッテリーユニット
112-11
バッテリーユニット
112-12
DC-DCコンバータ
116-3
DC-DCコンバータ
116-4
DC-DCコンバータ
116-9
DC-DCコンバータ
116-10
DC-DCコンバータ
116-11
DC-DCコンバータ
116-12
ディレクタ
118-2
ディスクエンクロージャ
136-5
ディスクエンクロージャ
136-6
ディスクエンクロージャ
136-7
ディスクエンクロージャ
136-8

Fig. 6

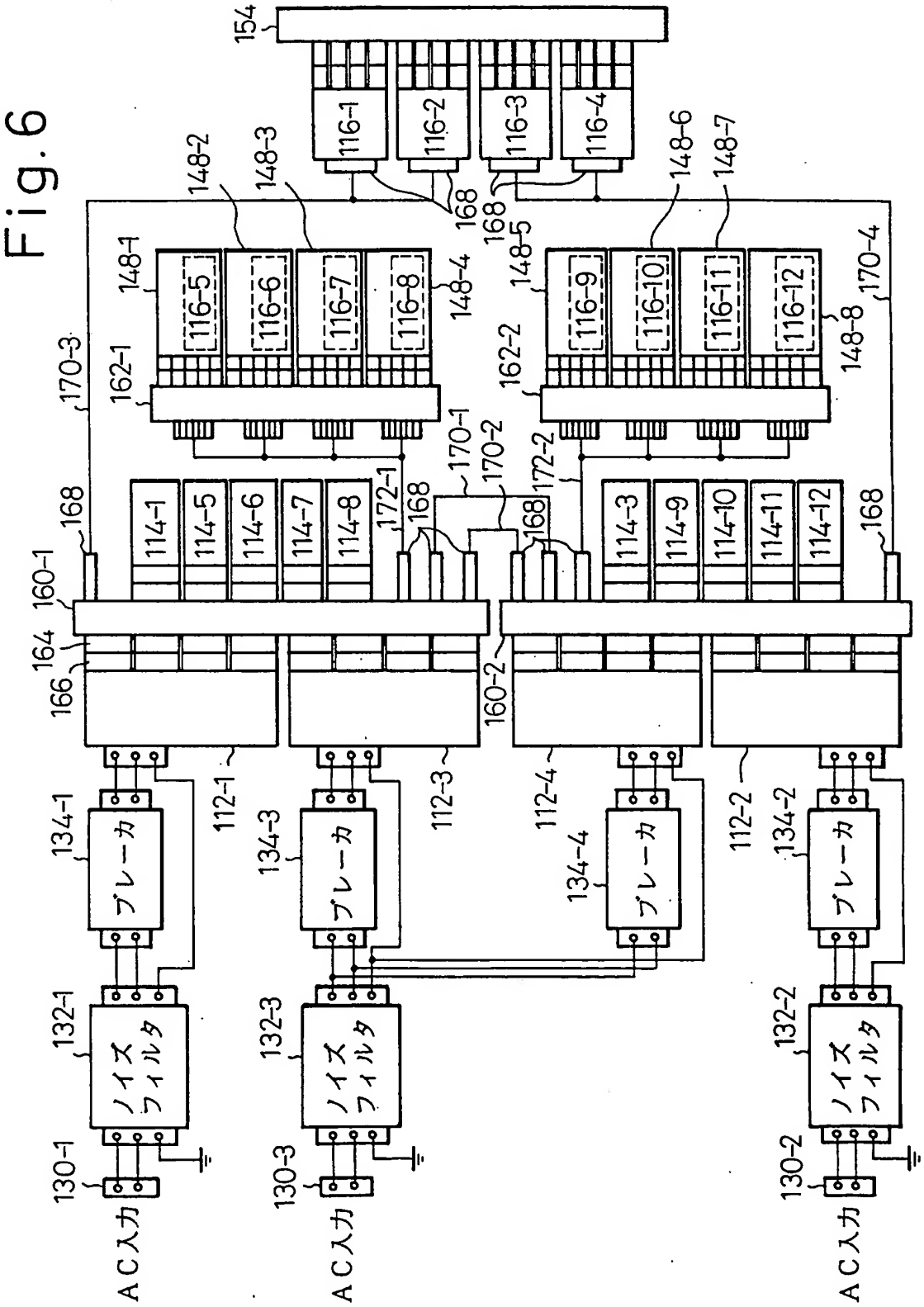

154
116-1
116-2
116-3
116-4
148-2
148-3
148-6
148-7
168
148-1
116-5
116-6
116-7
116-8
148-4
148-5
116-9
116-10
116-11
116-12
148-8
170-4
170-3
162-1
162-2
170-1
170-2
172-2
172-1
114-1
114-5
114-6
114-7
114-8
114-3
114-9
114-10
114-11
114-12
160-1
160-2
164
166
112-1
112-3
112-4
112-2
134-1
134-3
134-4
134-2
ブレーカ
132-1
132-3
132-2
ノイズフィルタ
130-1
130-3
130-2
AC入力

Fig.7

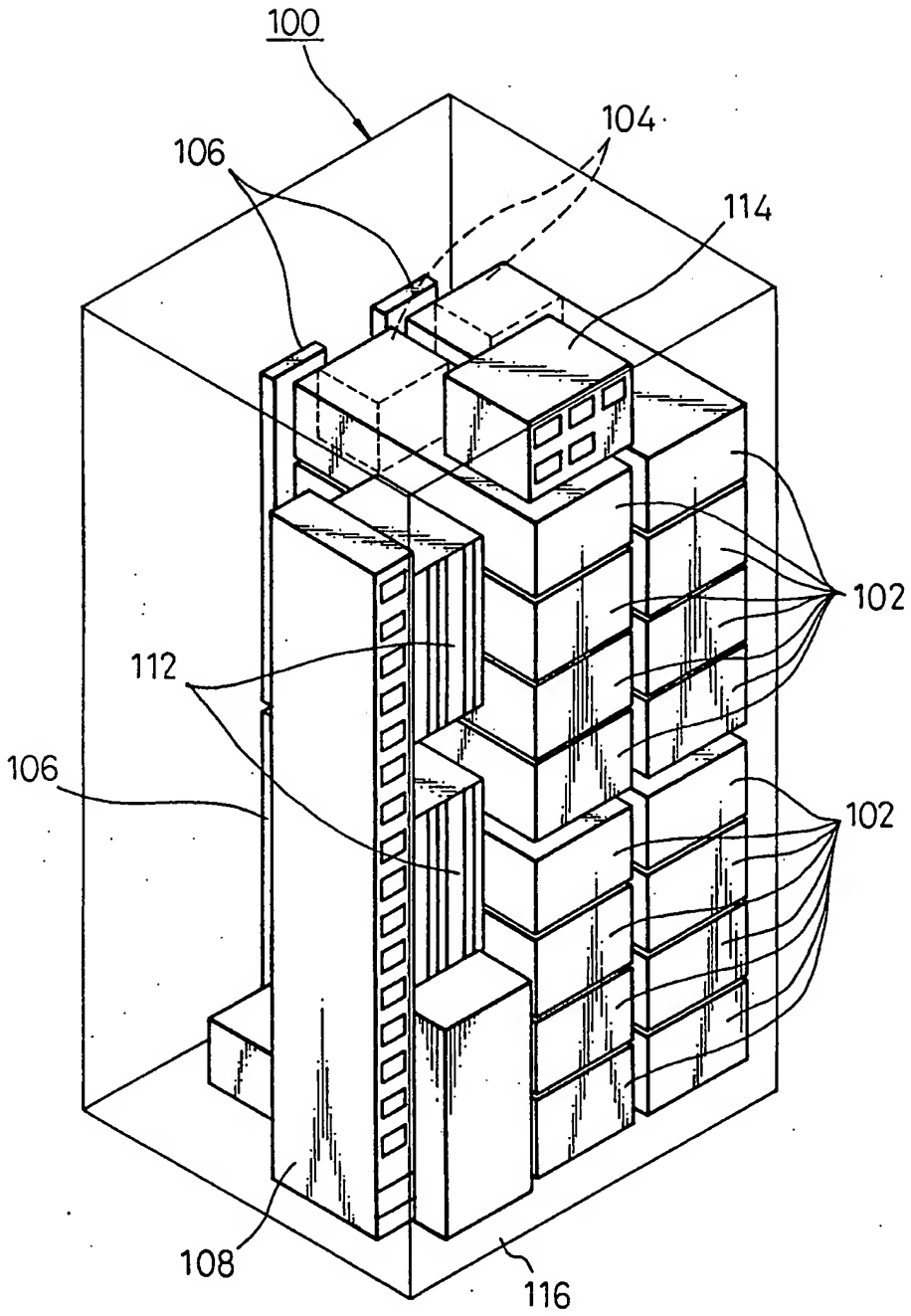


Fig.8

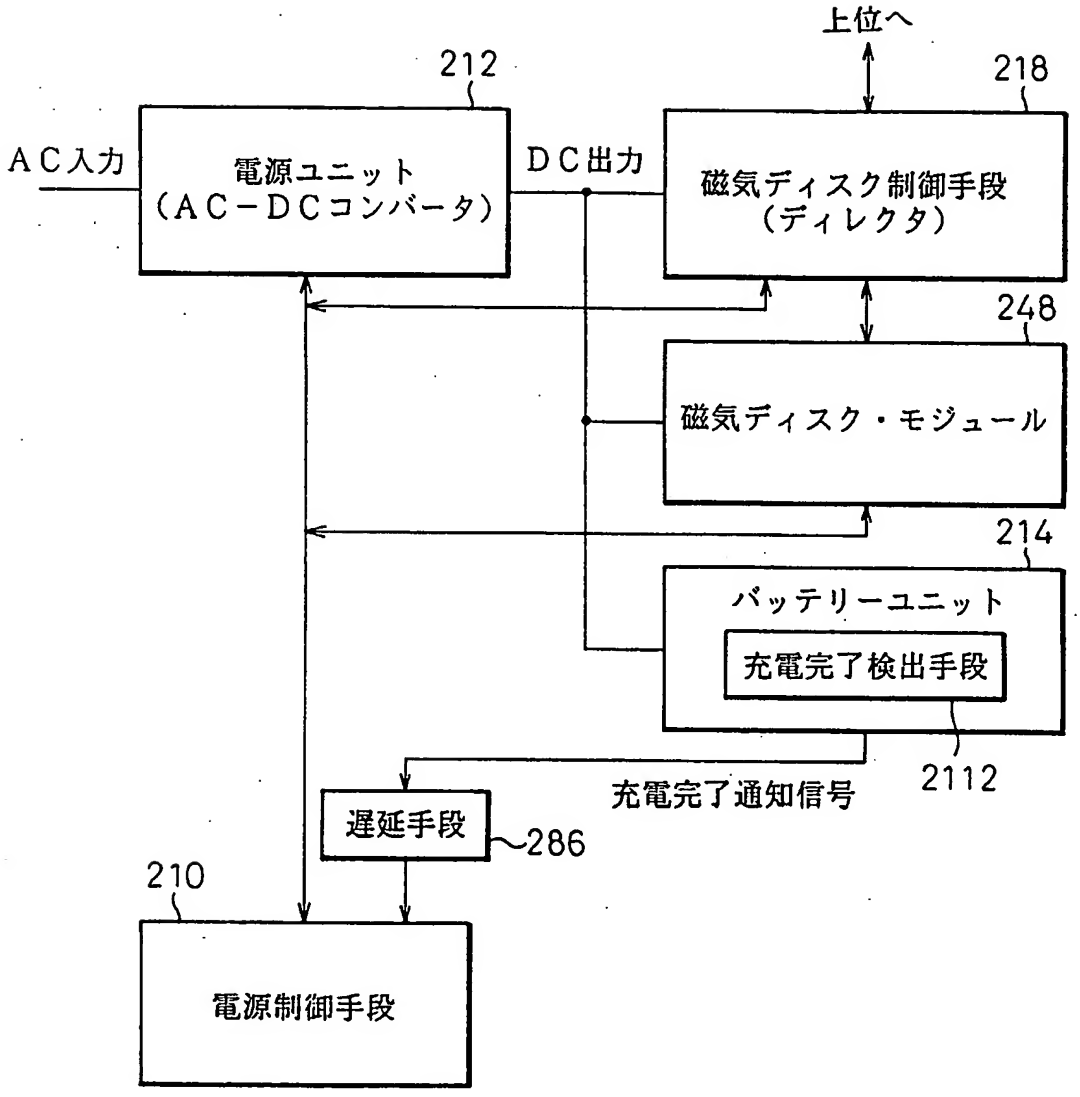

上位へ
212
218
AC入力
電源ユニット
(AC-DCコンバータ)
DC出力
磁気ディスク制御手段
(ディレクタ)
248
磁気ディスク・モジュール
214
バッテリーユニット
充電完了検出手段
2112
充電完了通知信号
遅延手段
286
210
電源制御手段

Fig.9

Fig.9A	Fig.9B

Fig.9A

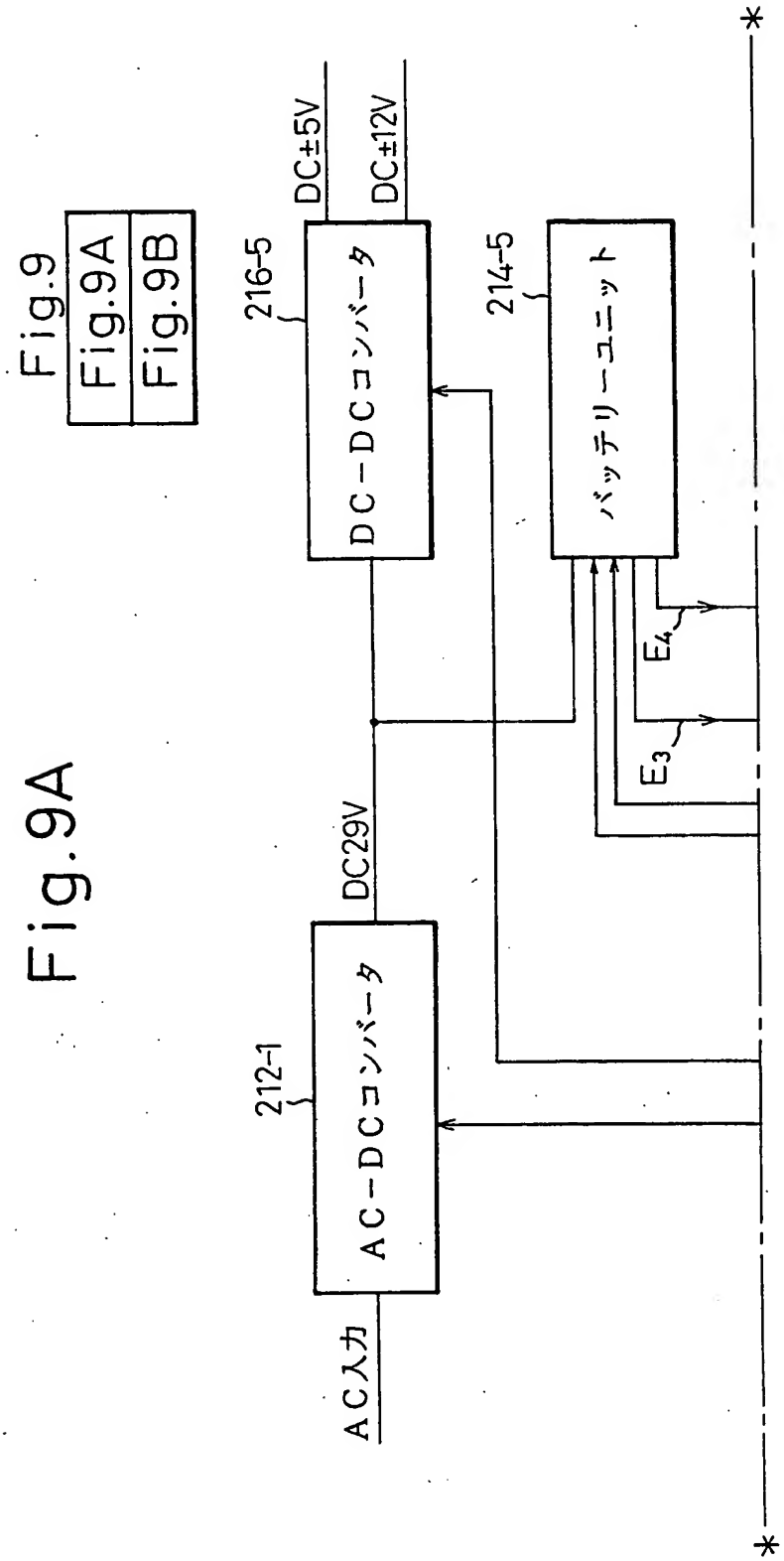


Fig.9B

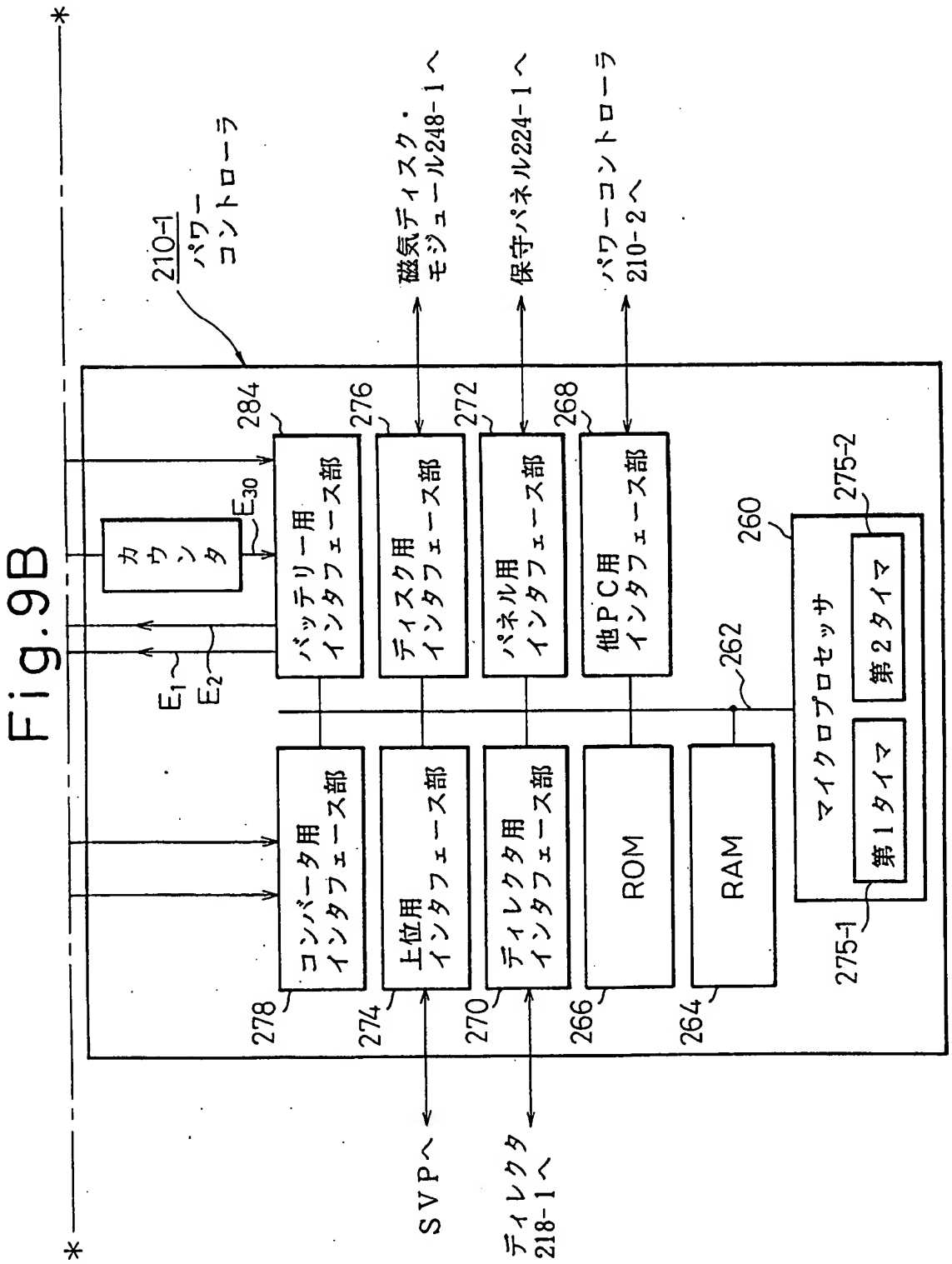
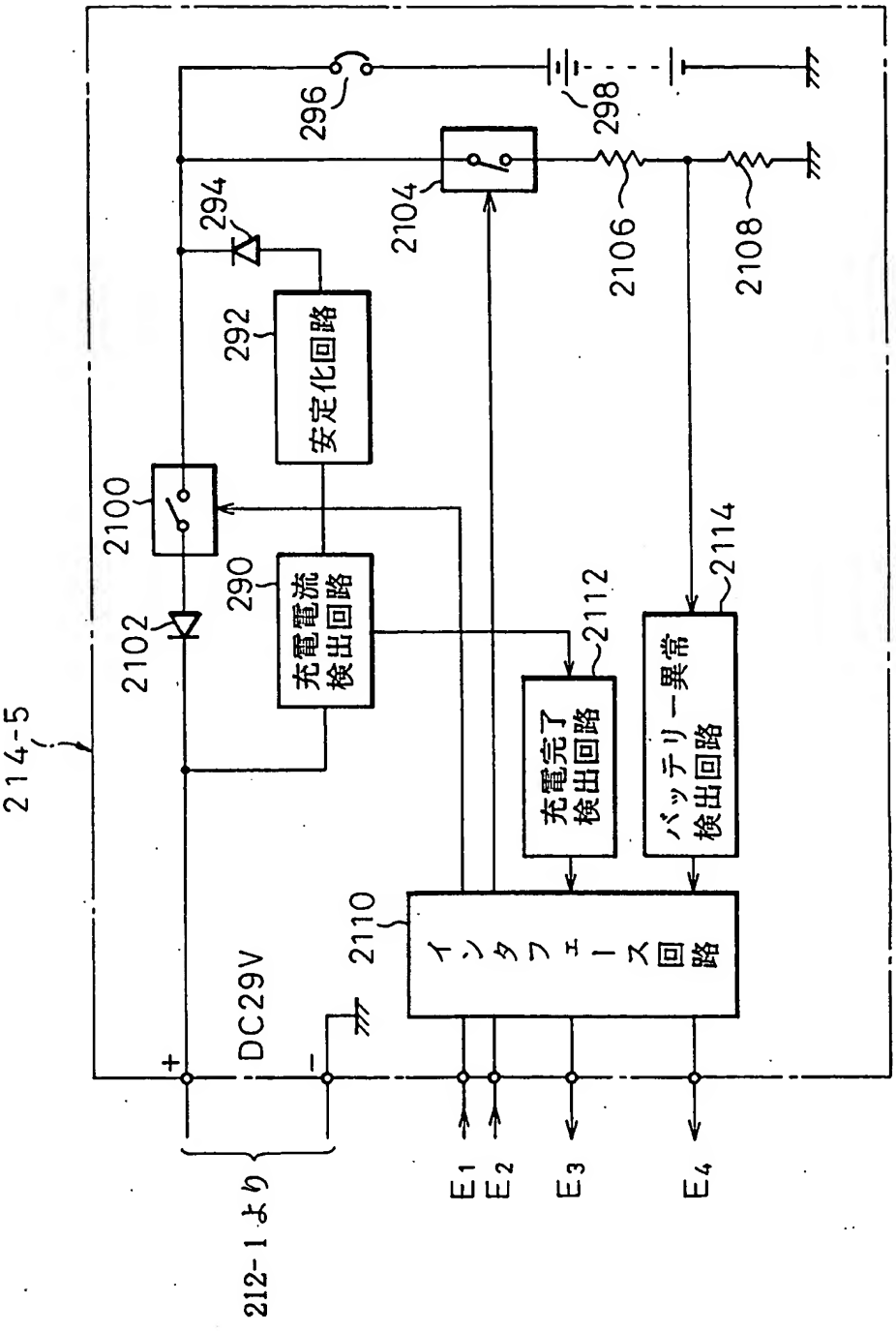

210-1
パワー
コントローラ
磁気ディスク・
モジュール248-1へ
保守パネル224-1へ
パワーコントローラ
210-2へ
284
276
272
268
カウンタ
E30
E1
E2
バッテリー用
インタフェース部
ディスク用
インタフェース部
パネル用
インタフェース部
他PC用
インタフェース部
260
275-2
262
マイクロプロセッサ
第1タイマ
第2タイマ
275-1
278
274
270
266
264
コンパータ用
インタフェース部
上位用
インタフェース部
ディレクタ用
インタフェース部
ROM
RAM
SVPへ
ディレクタ
218-1へ

Fig.10


214-5
296
298
294
2104
2106
2108
292
安定化回路
2100
2102
290
充電電流検出回路
2112
充電完了検出回路
2114
バッテリー異常検出回路
2110
インタフェース回路
DC29V
+
−
212-1より
E1
E2
E3
E4

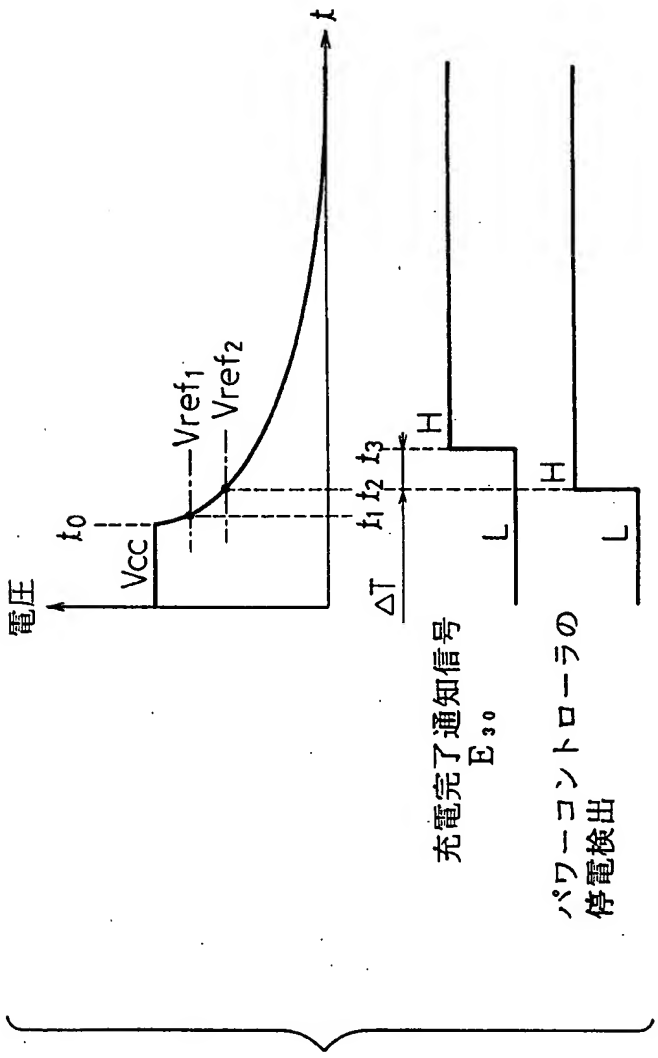

t
電圧
Vcc
t_0
$Vref_1$
$Vref_2$
t_1 t_2 t_3
ΔT
H
L
H
L
充電完了通知信号
E_{30}
パワーコントローラの
停電検出

Fig.11

Fig.12

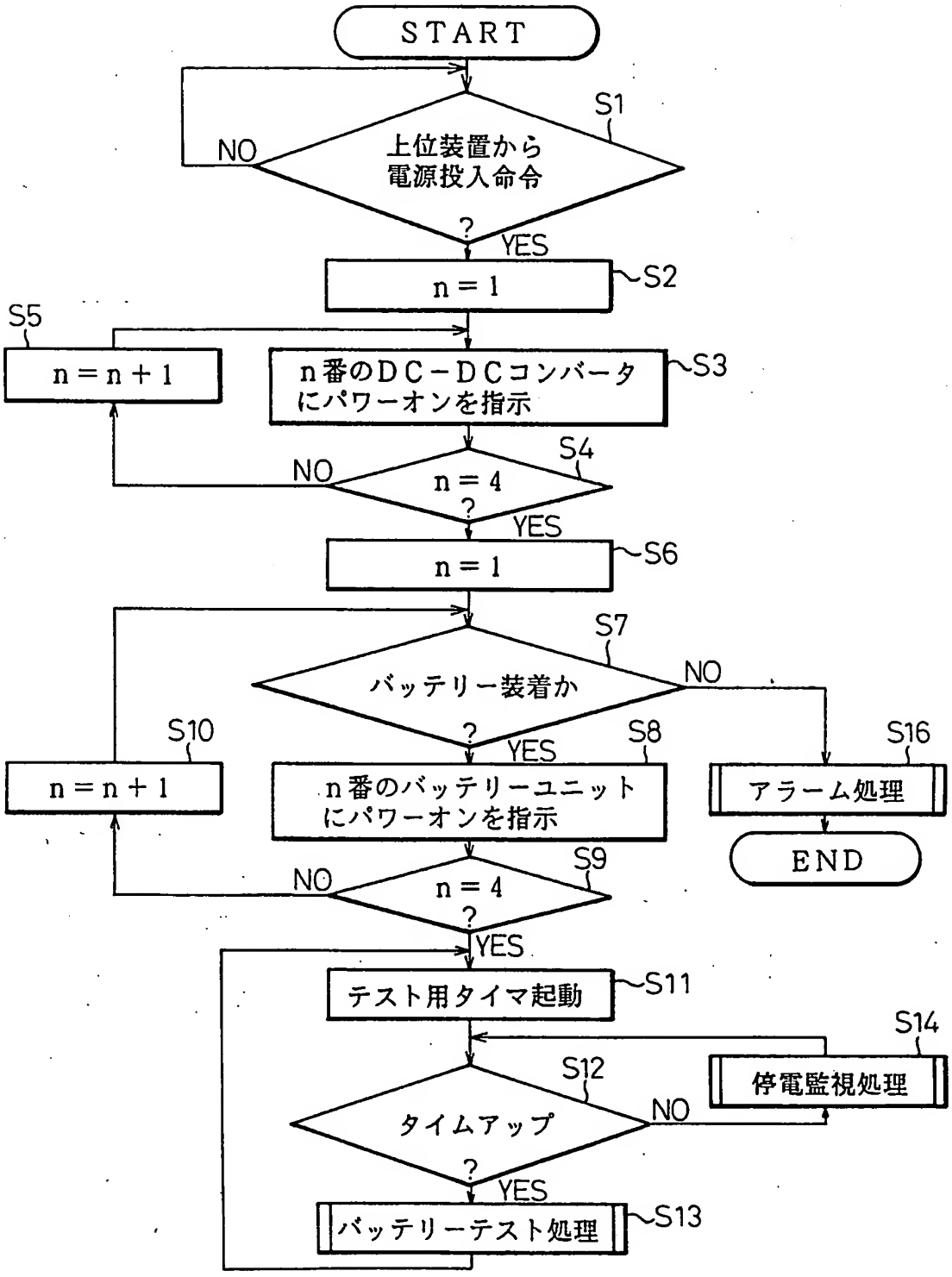

START
S1
NO
上位装置から
電源投入命令
?
YES
n = 1
S2
S5
n = n + 1
n番のDC－DCコンバータ
にパワーオンを指示
S3
S4
NO
n = 4
?
YES
n = 1
S6
S7
バッテリー装着か
NO
?
YES
S8
S10
S16
n = n + 1
n番のバッテリーユニット
にパワーオンを指示
アラーム処理
END
S9
NO
n = 4
?
YES
テスト用タイマ起動
S11
S14
S12
停電監視処理
タイムアップ
NO
?
YES
バッテリーテスト処理
S13

Fig.13

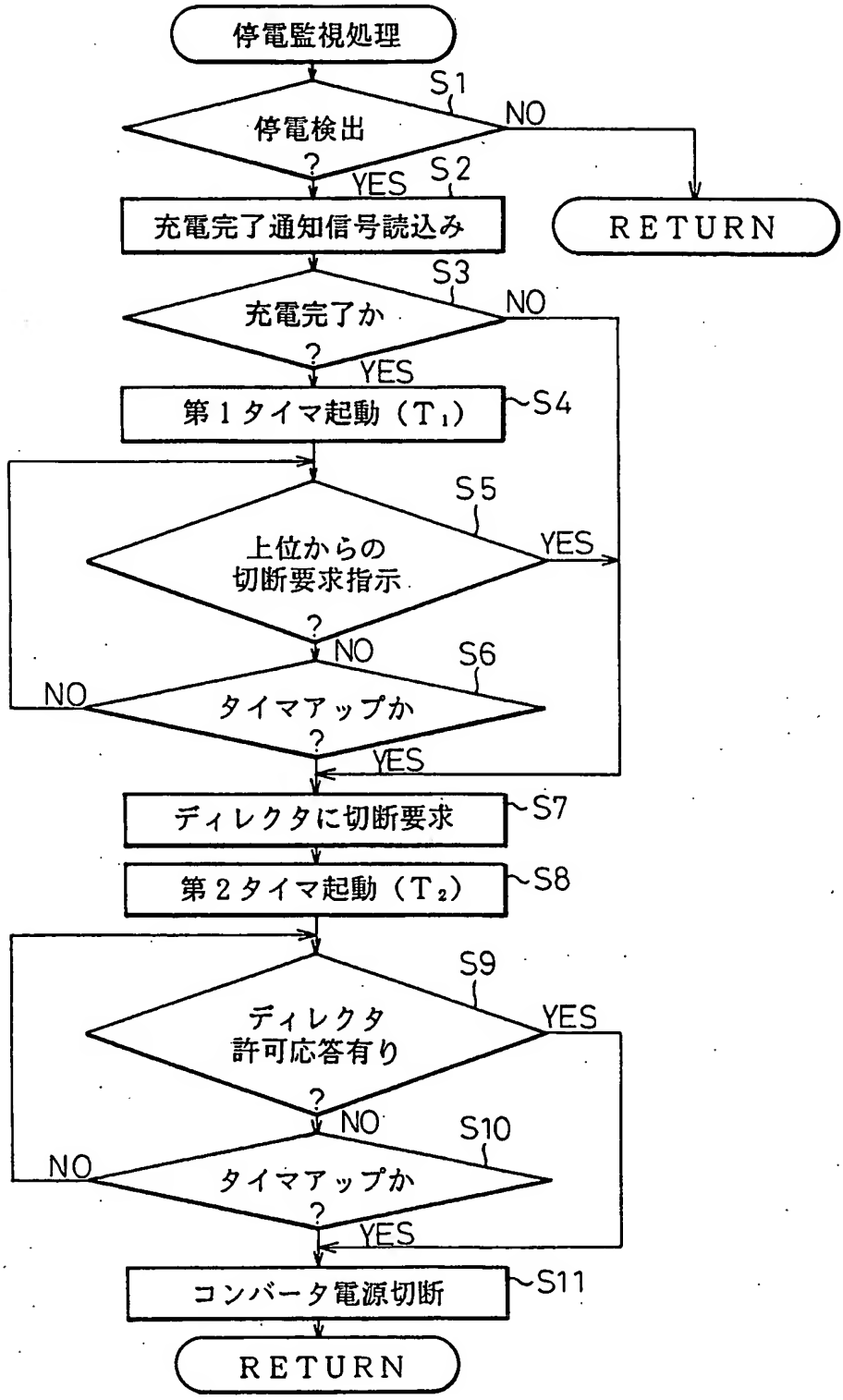

停電監視処理
S1
停電検出
?
NO
YES
S2
充電完了通知信号読込み
RETURN
S3
充電完了か
?
NO
YES
第1タイマ起動（T1）
S4
S5
上位からの
切断要求指示
?
YES
NO
S6
タイマアップか
?
NO
YES
ディレクタに切断要求
S7
第2タイマ起動（T2）
S8
S9
ディレクタ
許可応答有り
?
YES
NO
S10
タイマアップか
?
NO
YES
コンバータ電源切断
S11
RETURN

Fig.14

Fig.14A
Fig.14B

Fig.14A

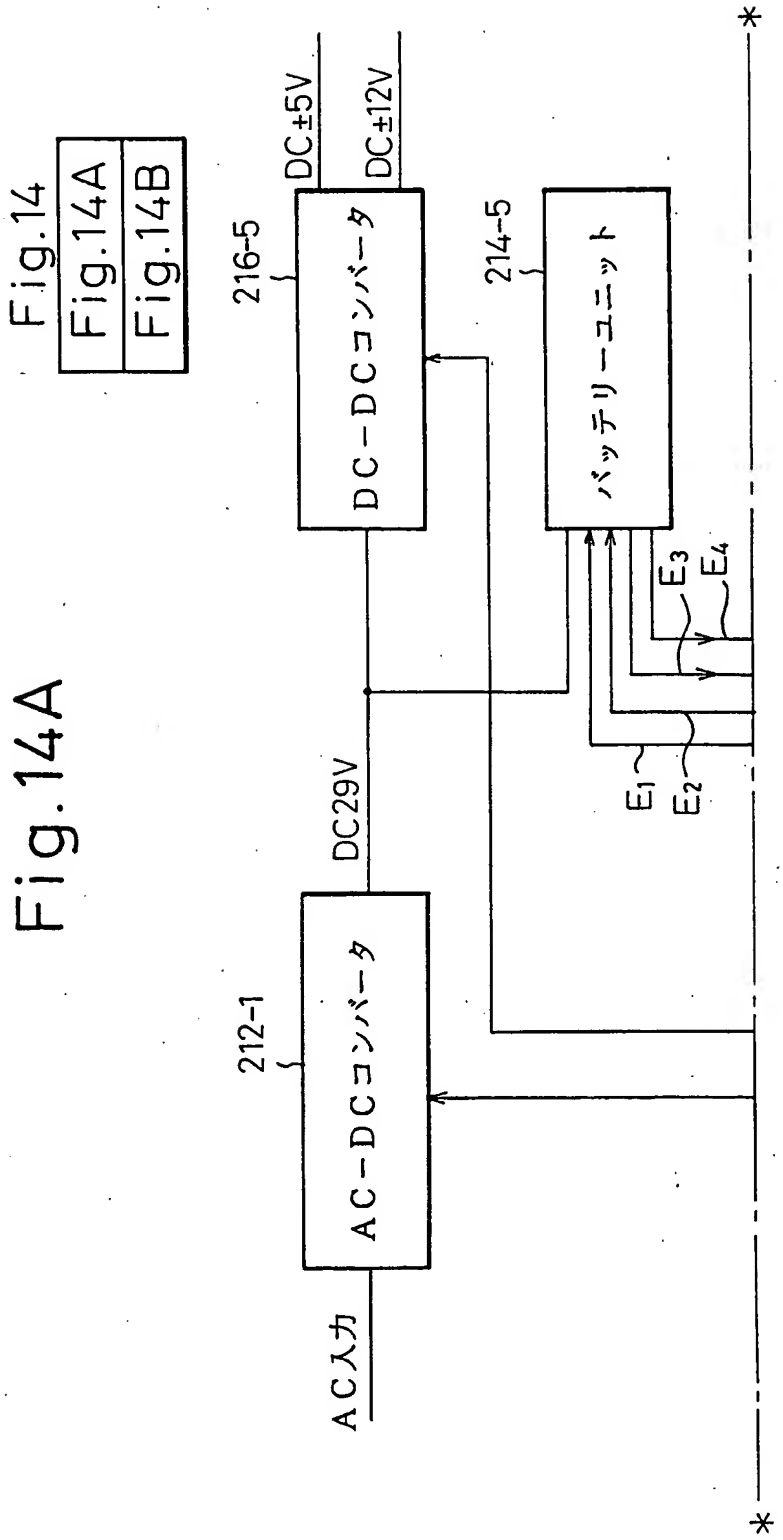
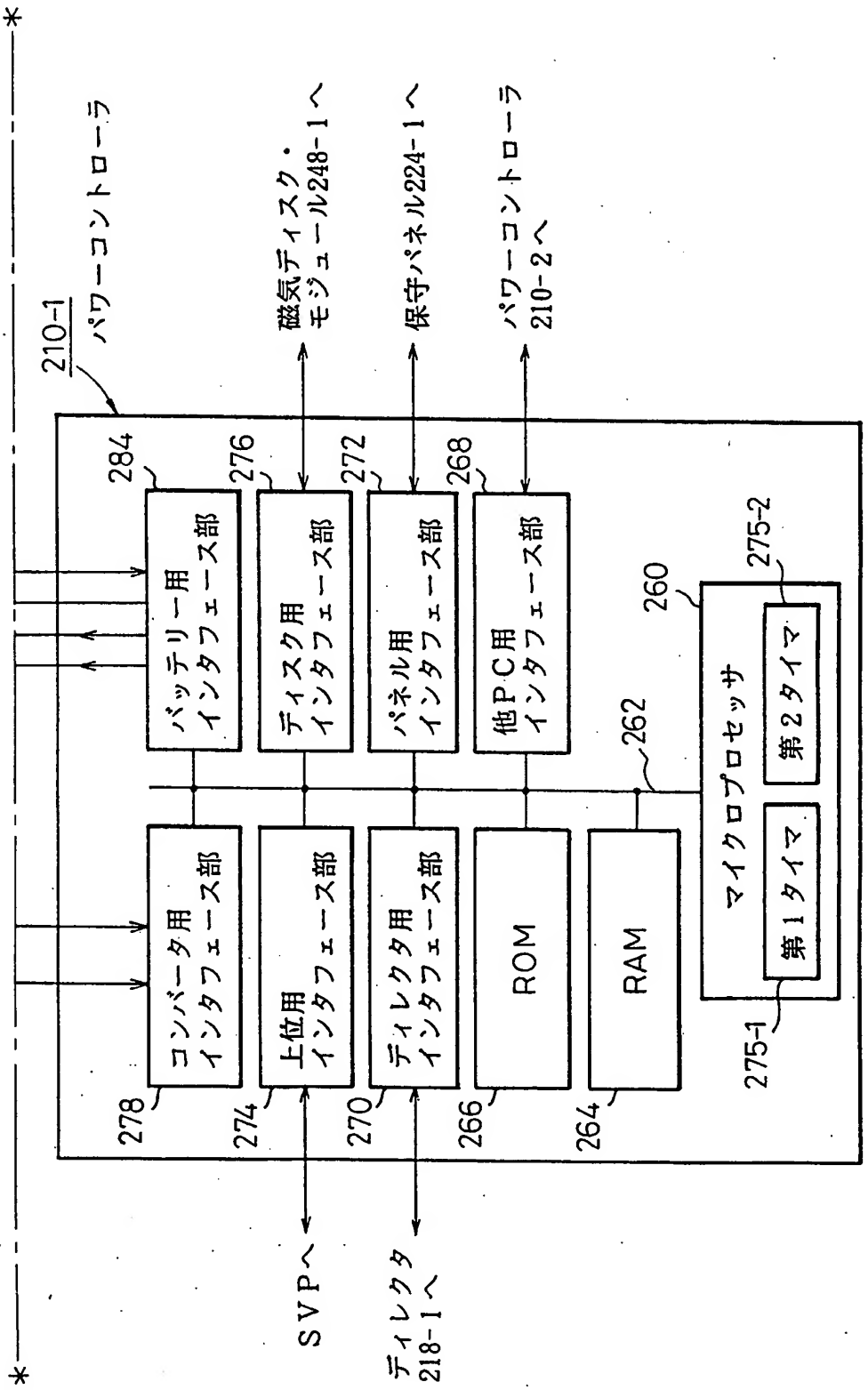


Fig.14B


210-1
パワーコントローラ
磁気ディスク・
モジュール248-1へ
保守パネル224-1へ
パワーコントローラ
210-2へ
284
276
272
268
バッテリー用
インタフェース部
ディスク用
インタフェース部
パネル用
インタフェース部
他PC用
インタフェース部
260
275-2
262
マイクロプロセッサ
第2タイマ
第1タイマ
275-1
278
274
270
266
264
コンパータ用
インタフェース部
上位用
インタフェース部
ディレクタ用
インタフェース部
ROM
RAM
SVPへ
ディレクタ
218-1へ

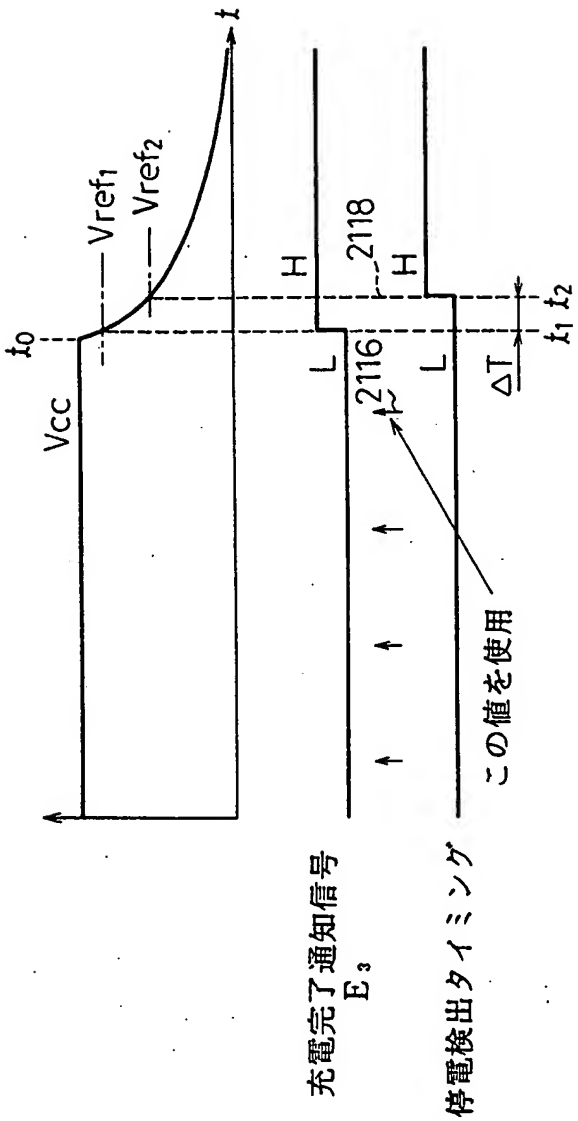

t
Vref1
Vref2
H
2118
H
t0
t1 t2
Vcc
L
2116
L
ΔT
この値を使用
充電完了通知信号
E3
停電検出タイミング

Fig.15

Fig.16

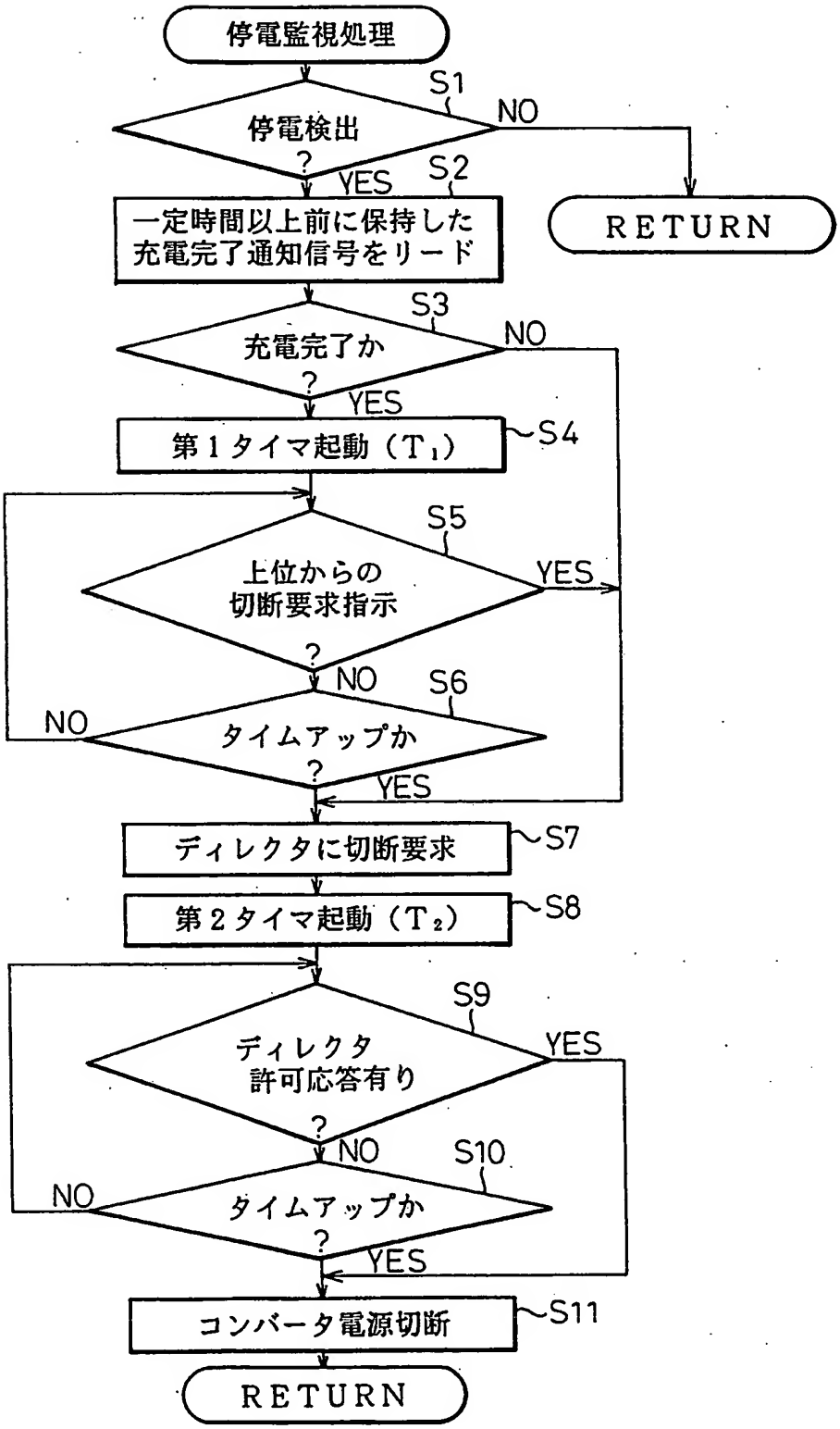
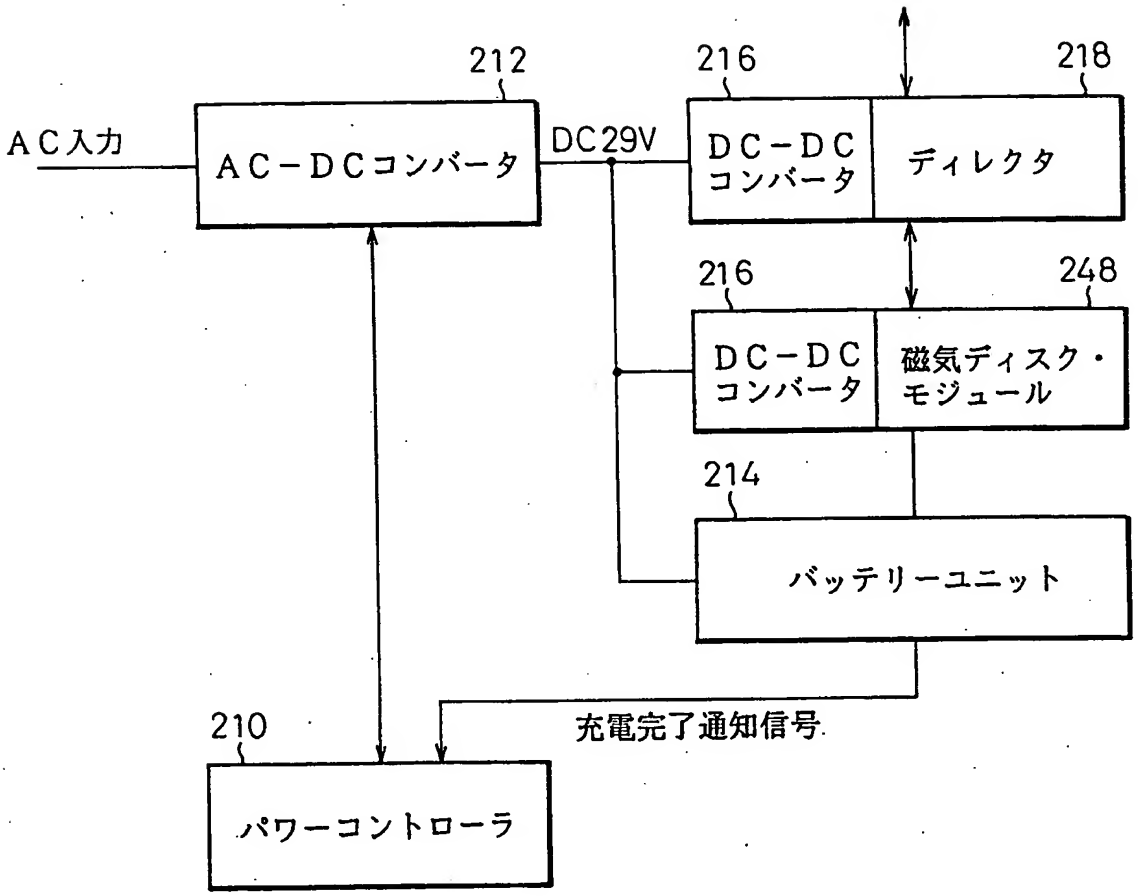

停電監視処理
S1
停電検出
?
NO
YES
S2
一定時間以上前に保持した
充電完了通知信号をリード
RETURN
S3
充電完了か
?
NO
YES
第1タイマ起動（T1）
S4
S5
上位からの
切断要求指示
?
YES
NO
S6
タイムアップか
?
NO
YES
ディレクタに切断要求
S7
第2タイマ起動（T2）
S8
S9
ディレクタ
許可応答有り
?
YES
NO
S10
タイムアップか
?
NO
YES
コンバータ電源切断
S11
RETURN

Fig.17


212
216
218
AC入力
AC－DCコンバータ
DC29V
DC－DC コンバータ
ディレクタ
216
248
DC－DC コンバータ
磁気ディスク・ モジュール
214
バッテリーユニット
充電完了通知信号
210
パワーコントローラ

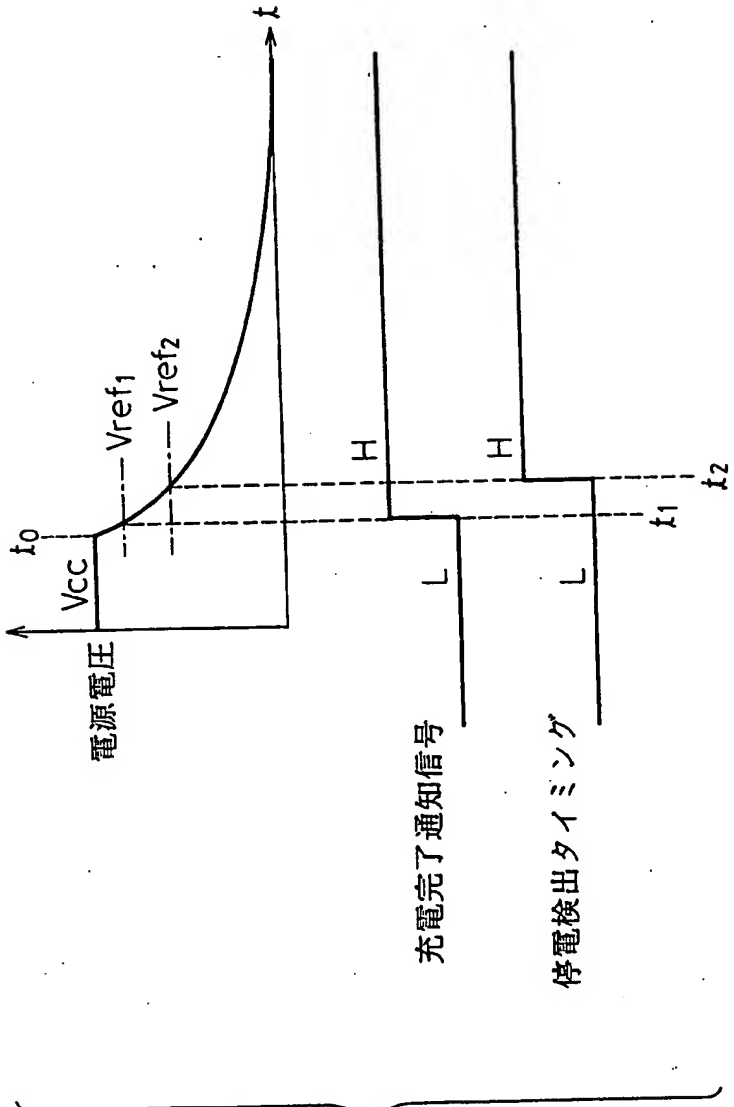


Fig. 18

Fig.19

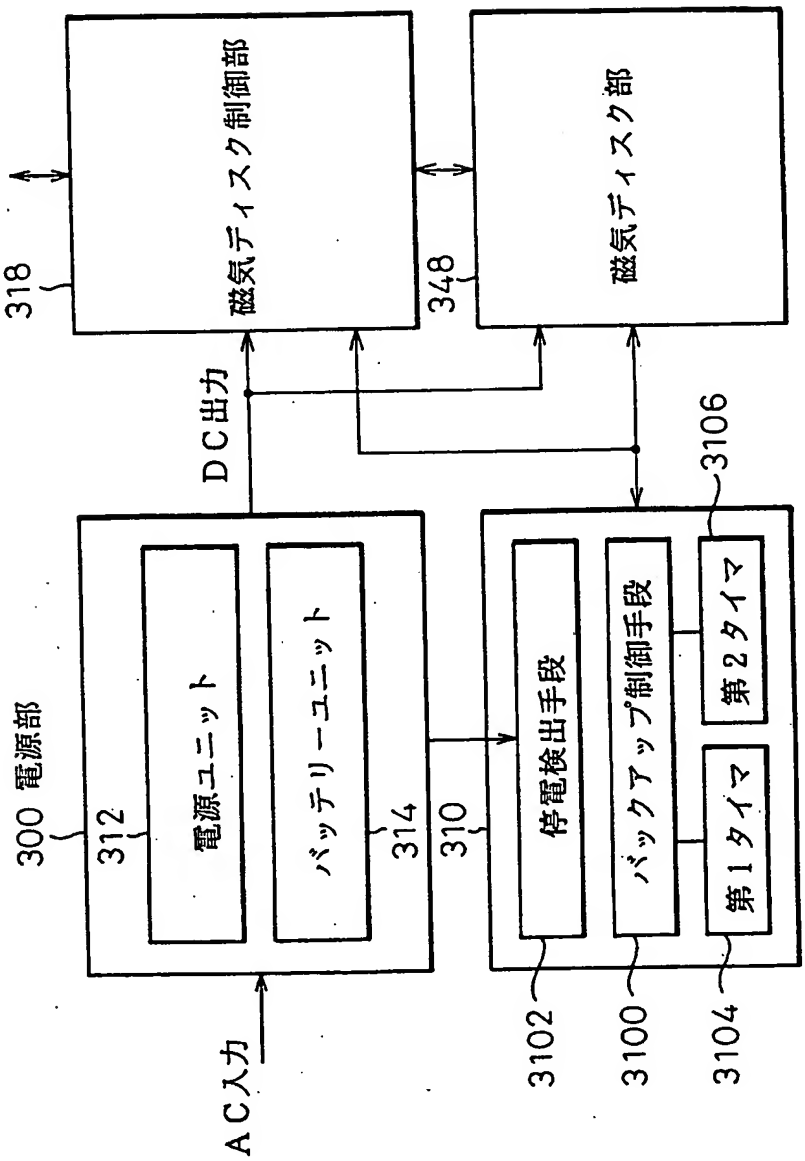

318
磁気ディスク制御部
348
磁気ディスク部
DC出力
3106
300 電源部
312
電源ユニット
バッテリーユニット
314
310
停電検出手段
バックアップ制御手段
第2タイマ
第1タイマ
AC入力
3102
3100
3104

Fig.20

Fig.20A
Fig.20B

Fig.20A

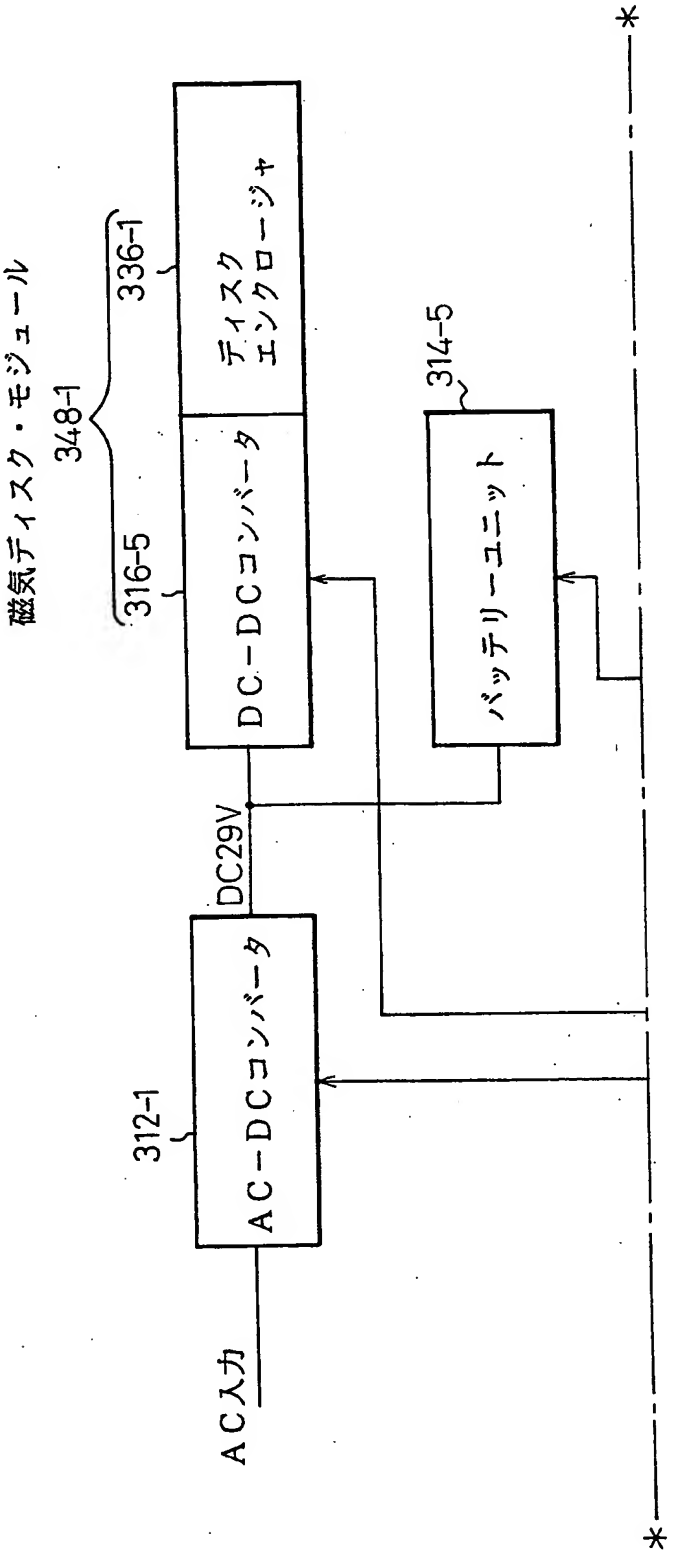


Fig. 20B

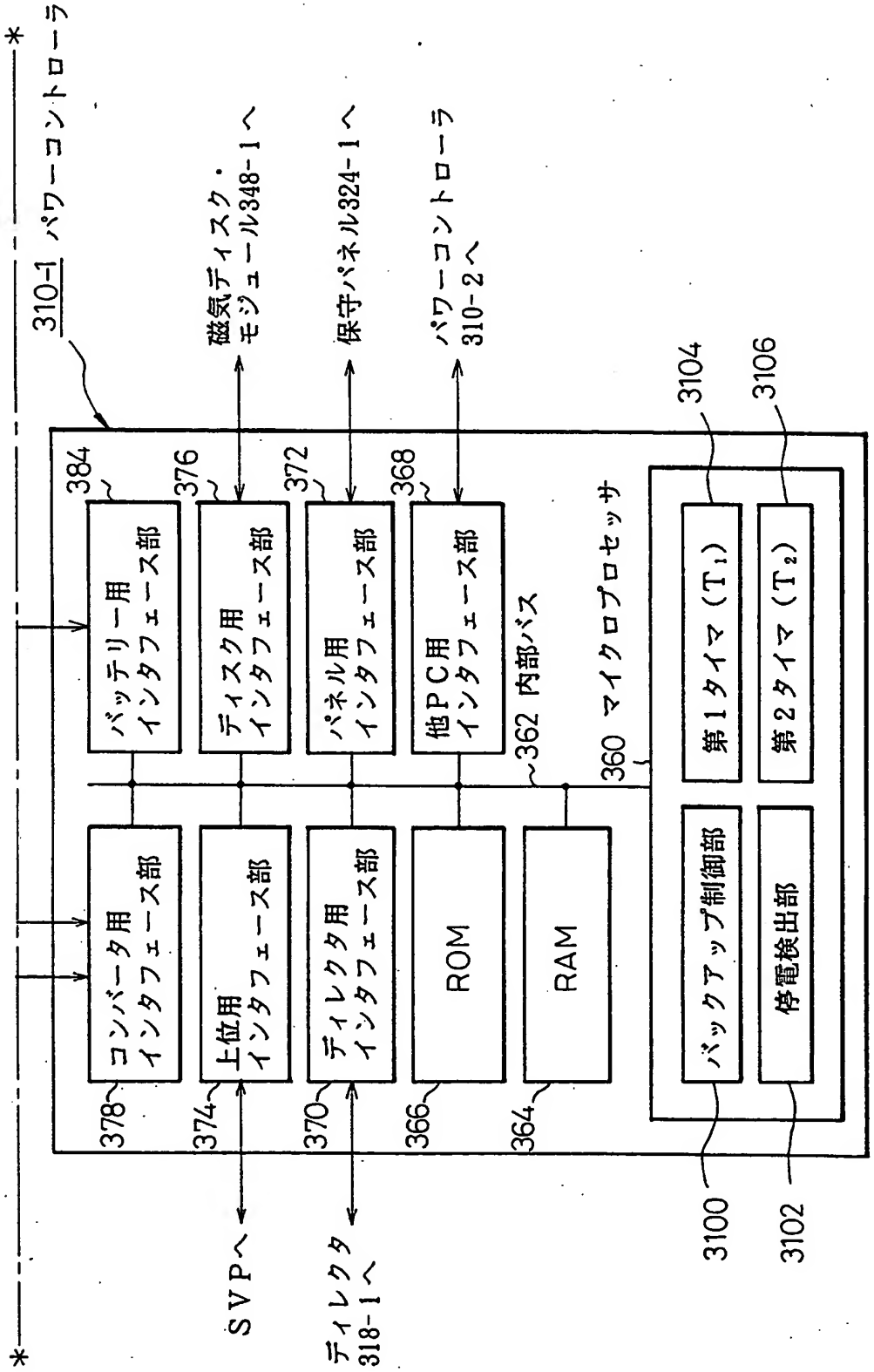

310-1 パワーコントローラ
磁気ディスク・モジュール348-1へ
保守パネル324-1へ
パワーコントローラ310-2へ
384
376
372
368
3104
3106
バッテリー用インタフェース部
ディスク用インタフェース部
パネル用インタフェース部
他PC用インタフェース部
362 内部バス
360 マイクロプロセッサ
第1タイマ（T1）
第2タイマ（T2）
コンパータ用インタフェース部
上位用インタフェース部
ディレクタ用インタフェース部
ROM
RAM
バックアップ制御部
停電検出部
378
374
370
366
364
3100
3102
SVPへ
ディレクタ318-1へ

Fig.21

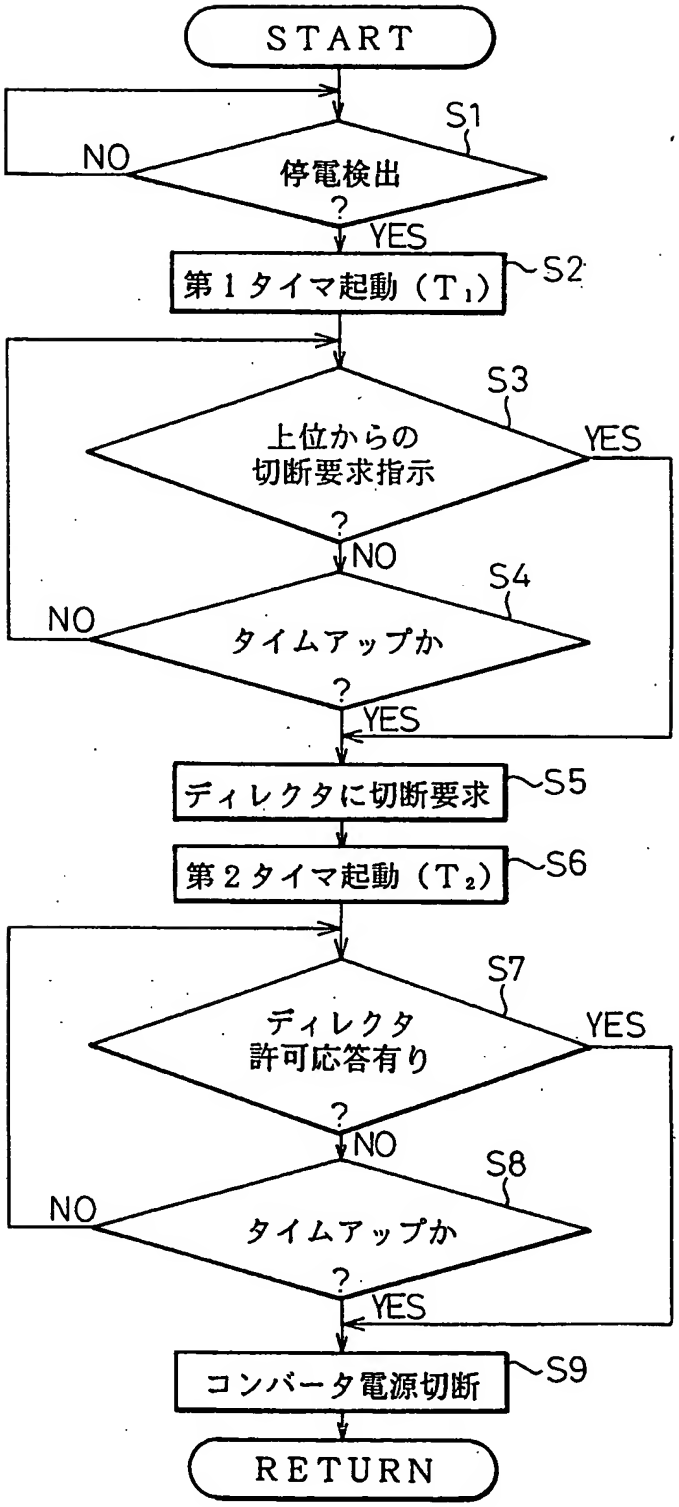

START
S1
NO
停電検出
?
YES
第1タイマ起動（T1）
S2
S3
上位からの
切断要求指示
YES
?
NO
S4
NO
タイムアップか
?
YES
ディレクタに切断要求
S5
第2タイマ起動（T2）
S6
S7
ディレクタ
許可応答有り
YES
?
NO
S8
NO
タイムアップか
?
YES
コンバータ電源切断
S9
RETURN

Fig.22

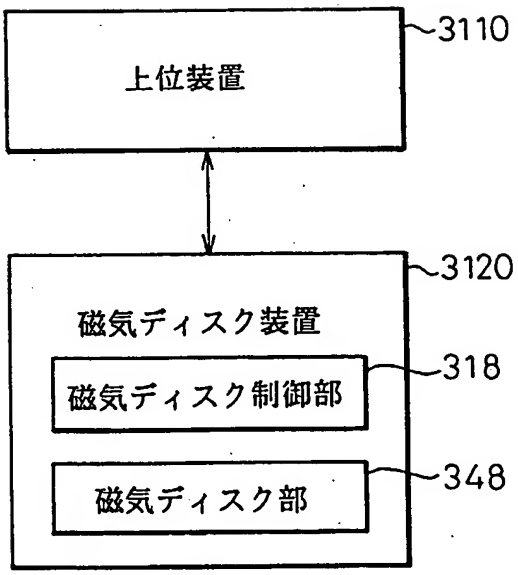


Fig.23

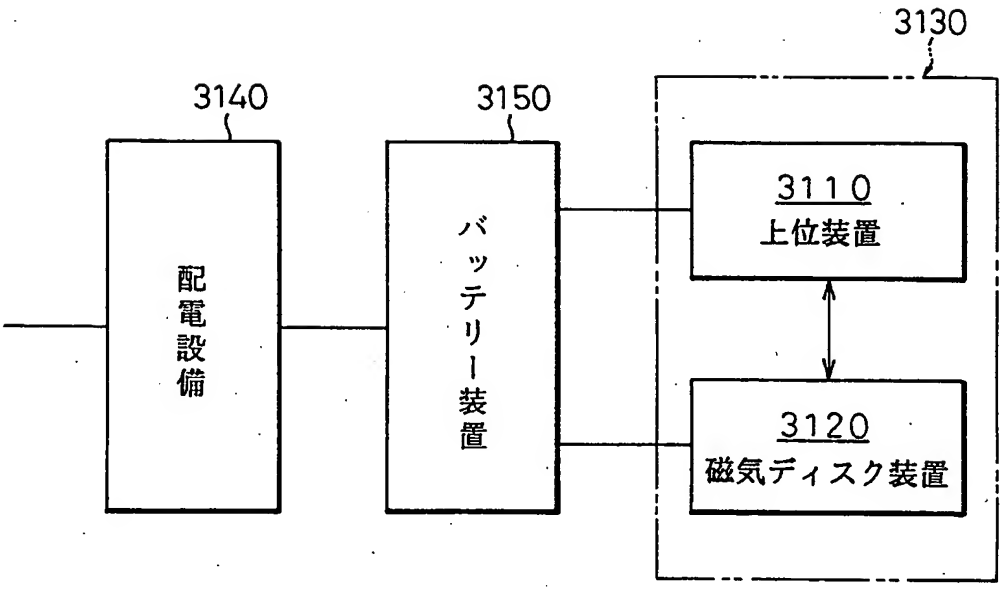
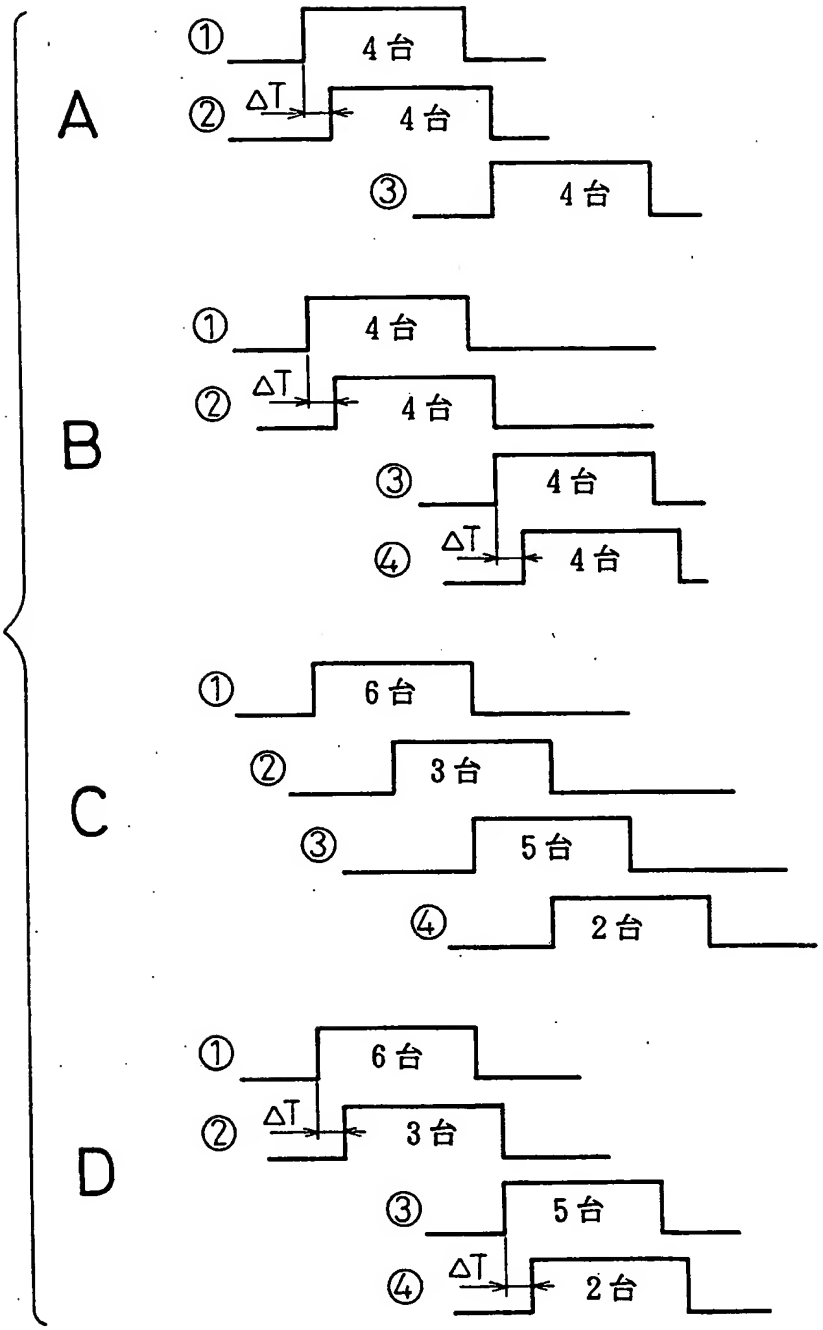


Fig.24


A
①
4台
②
ΔT
4台
③
4台
B
①
4台
②
ΔT
4台
③
4台
④
ΔT
4台
C
①
6台
②
3台
③
5台
④
2台
D
①
6台
②
ΔT
3台
③
5台
④
ΔT
2台

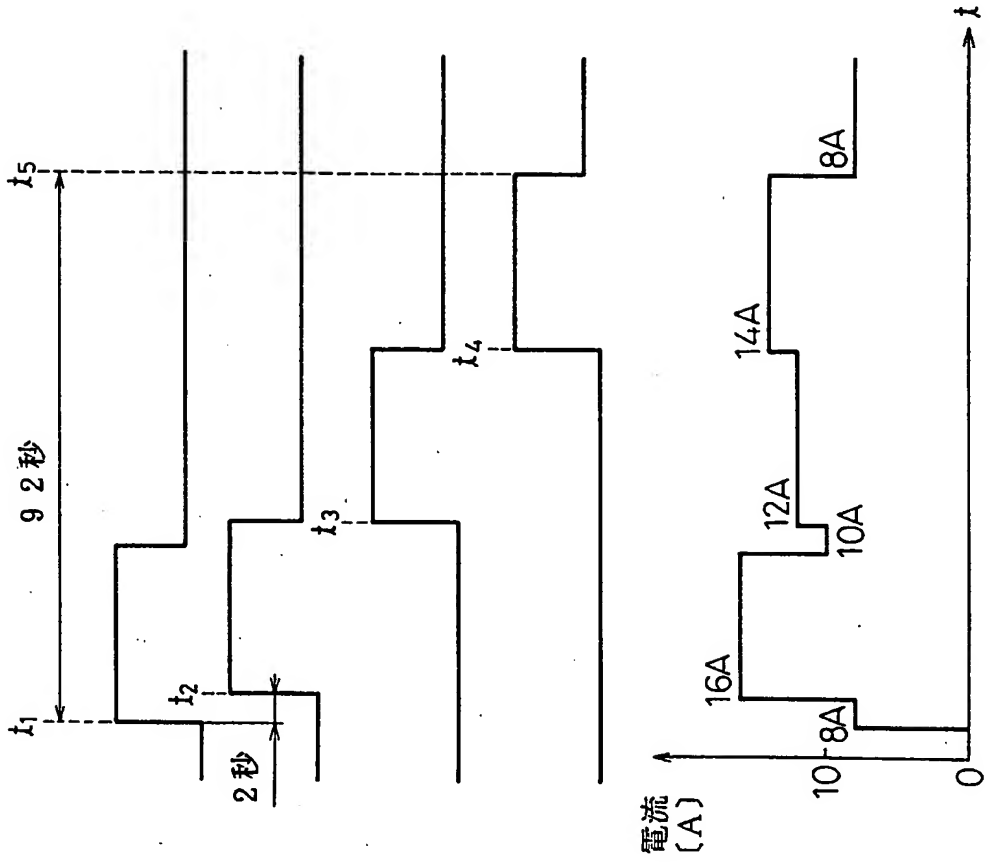

A グループ#1 (4台)
B グループ#2 (4台)
C グループ#3 (4台)
D グループ#4 (4台)
E 合計電流
t1
t2
t3
t4
t5
92秒
2秒
電流〔A〕
0
10
8A
16A
10A
12A
14A
8A
t

Fig. 25

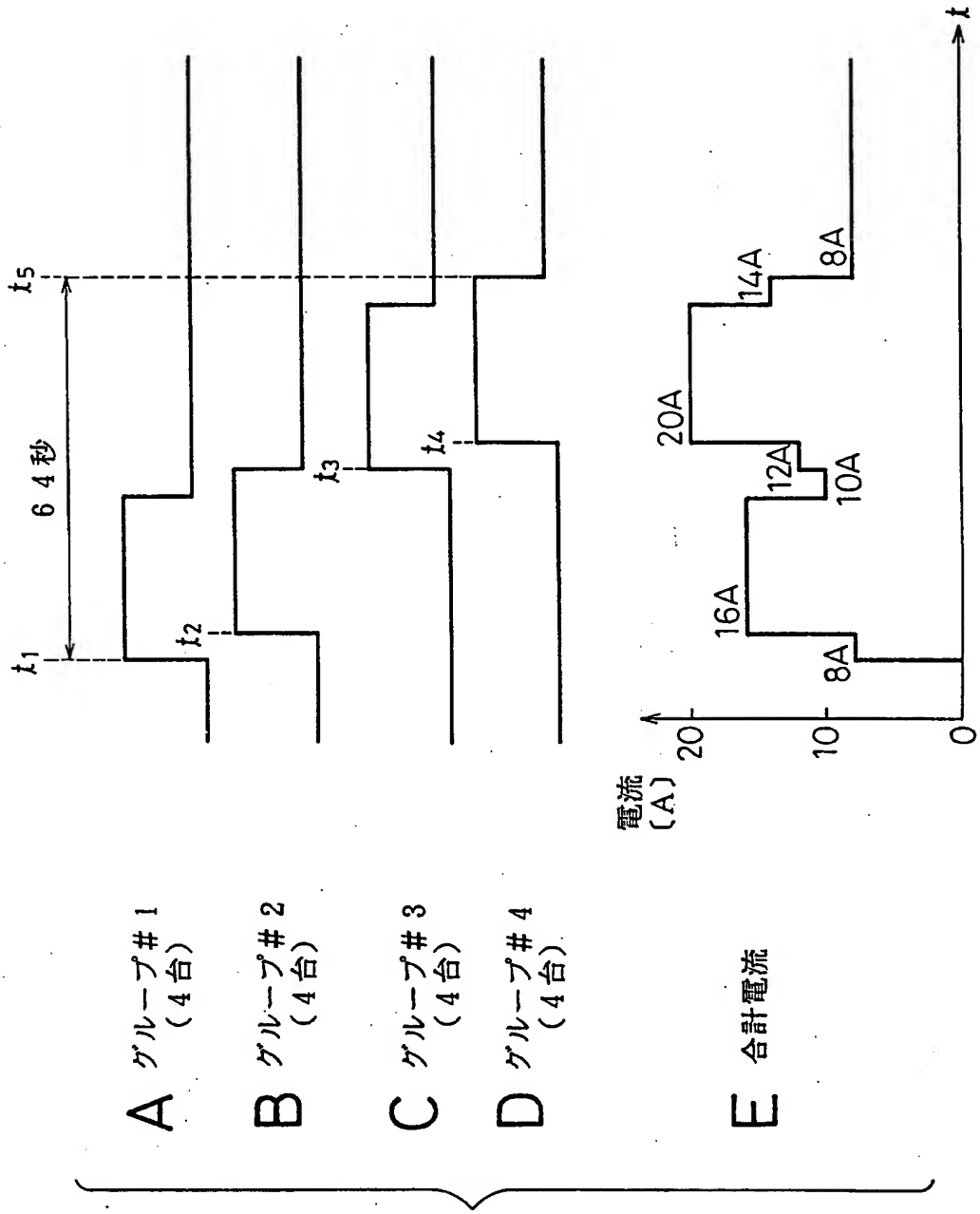

A グループ#1 (4台)
B グループ#2 (4台)
C グループ#3 (4台)
D グループ#4 (4台)
E 合計電流
t1
t2
t3
t4
t5
64秒
電流 (A)
20
10
0
t
8A
16A
8A
20A
12A
10A
14A
8A

Fig.26

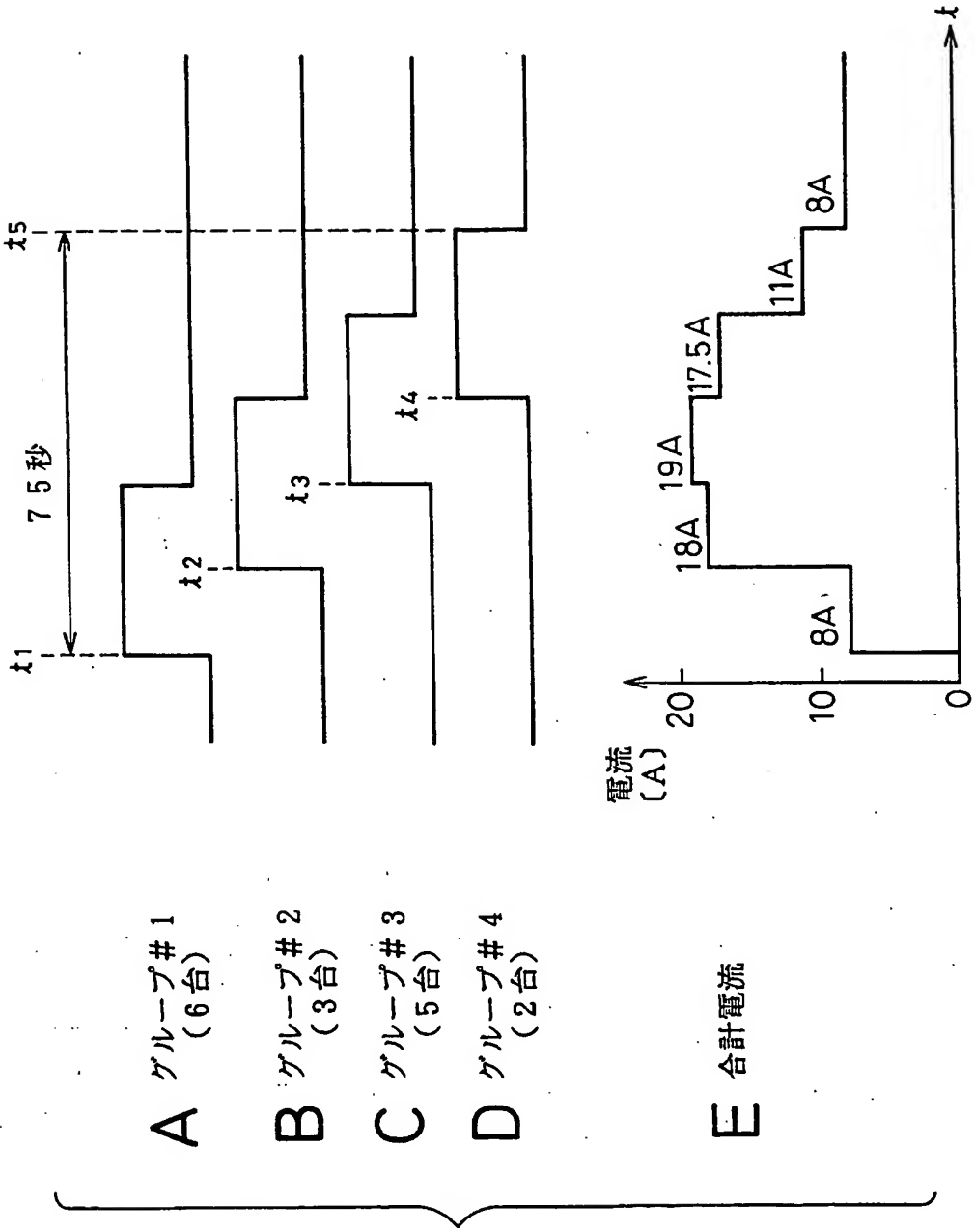

A グループ#1 (6台)
B グループ#2 (3台)
C グループ#3 (5台)
D グループ#4 (2台)
E 合計電流
t1
t2
t3
t4
t5
75秒
電流 (A)
20
10
0
18A
19A
17.5A
11A
8A
8A
t

Fig.27

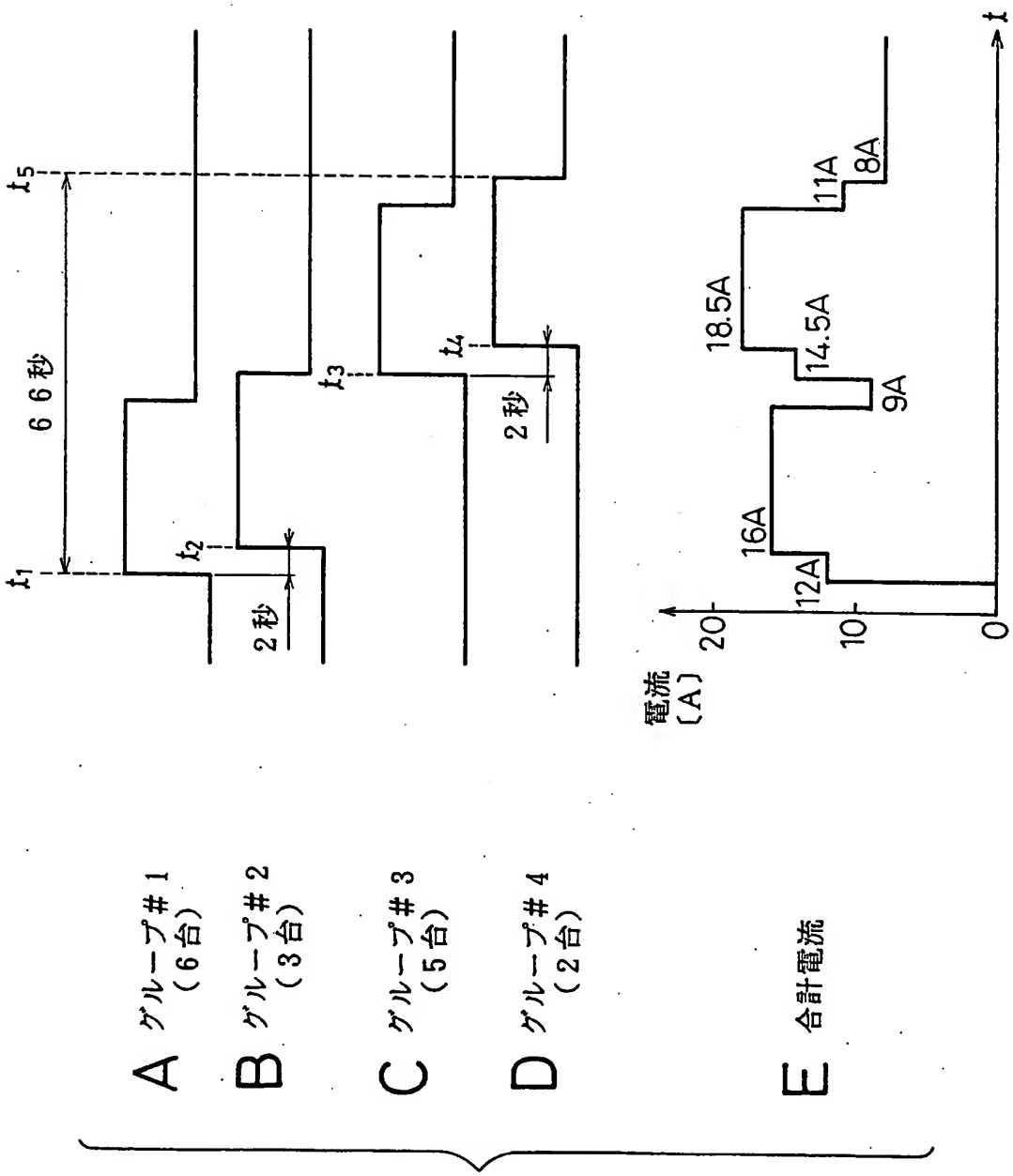

A グループ#1 (6台)
B グループ#2 (3台)
C グループ#3 (5台)
D グループ#4 (2台)
E 合計電流
t1
t2
t3
t4
t5
66秒
2秒
2秒
電流〔A〕
20
10
0
t
16A
12A
18.5A
14.5A
9A
11A
8A

Fig. 28

Fig. 29A

Fig. 29

Fig. 29A
Fig. 29B

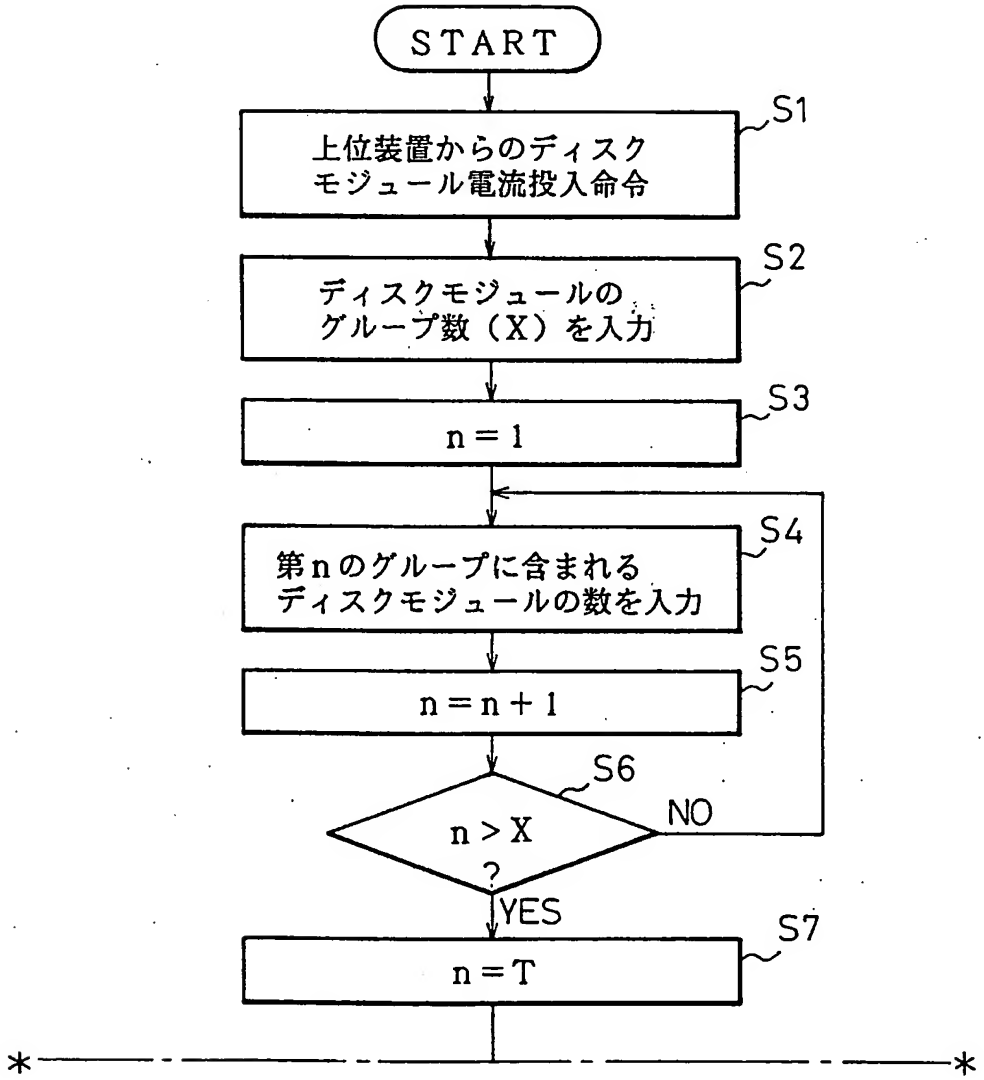


Fig. 29B

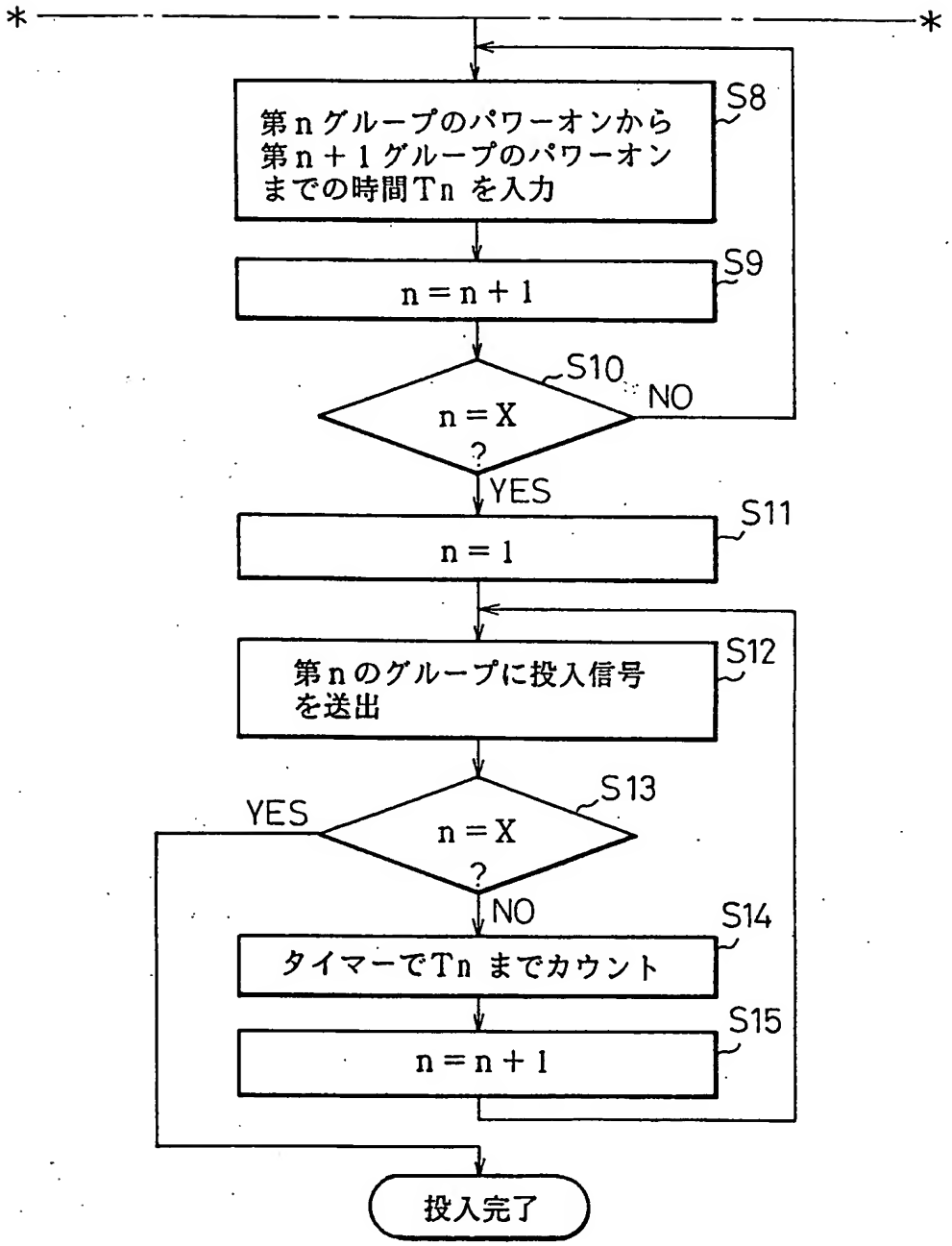
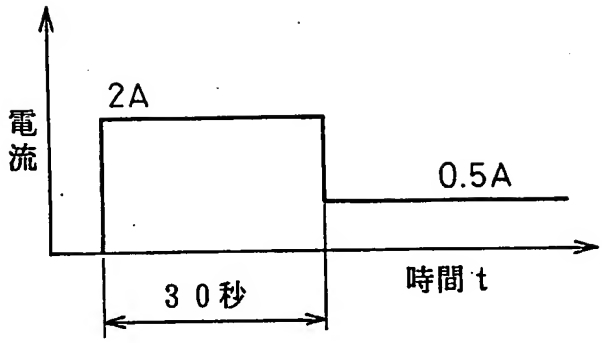

第nグループのパワーオンから第n＋1グループのパワーオンまでの時間Tn を入力
S8
n＝n＋1
S9
n＝X ?
S10
NO
YES
n＝1
S11
第nのグループに投入信号を送出
S12
n＝X ?
S13
YES
NO
タイマーでTn までカウント
S14
n＝n＋1
S15
投入完了

Fig.30



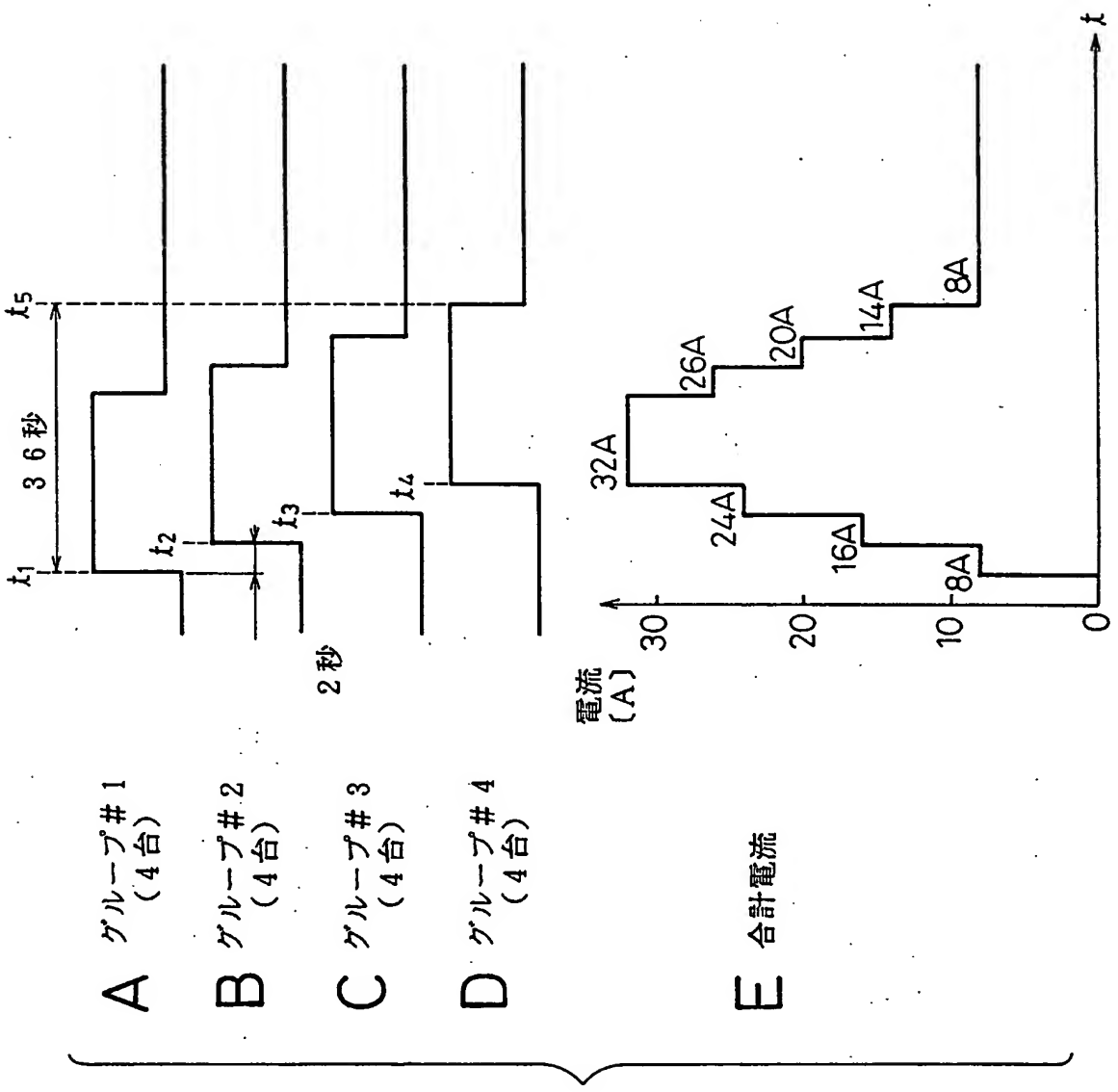

A グループ#1 (4台)
B グループ#2 (4台)
C グループ#3 (4台)
D グループ#4 (4台)
E 合計電流
t1
t2
t3
t4
t5
36秒
2秒
電流〔A〕
30
20
10
0
32A
26A
24A
20A
16A
14A
8A
8A
t

Fig.31

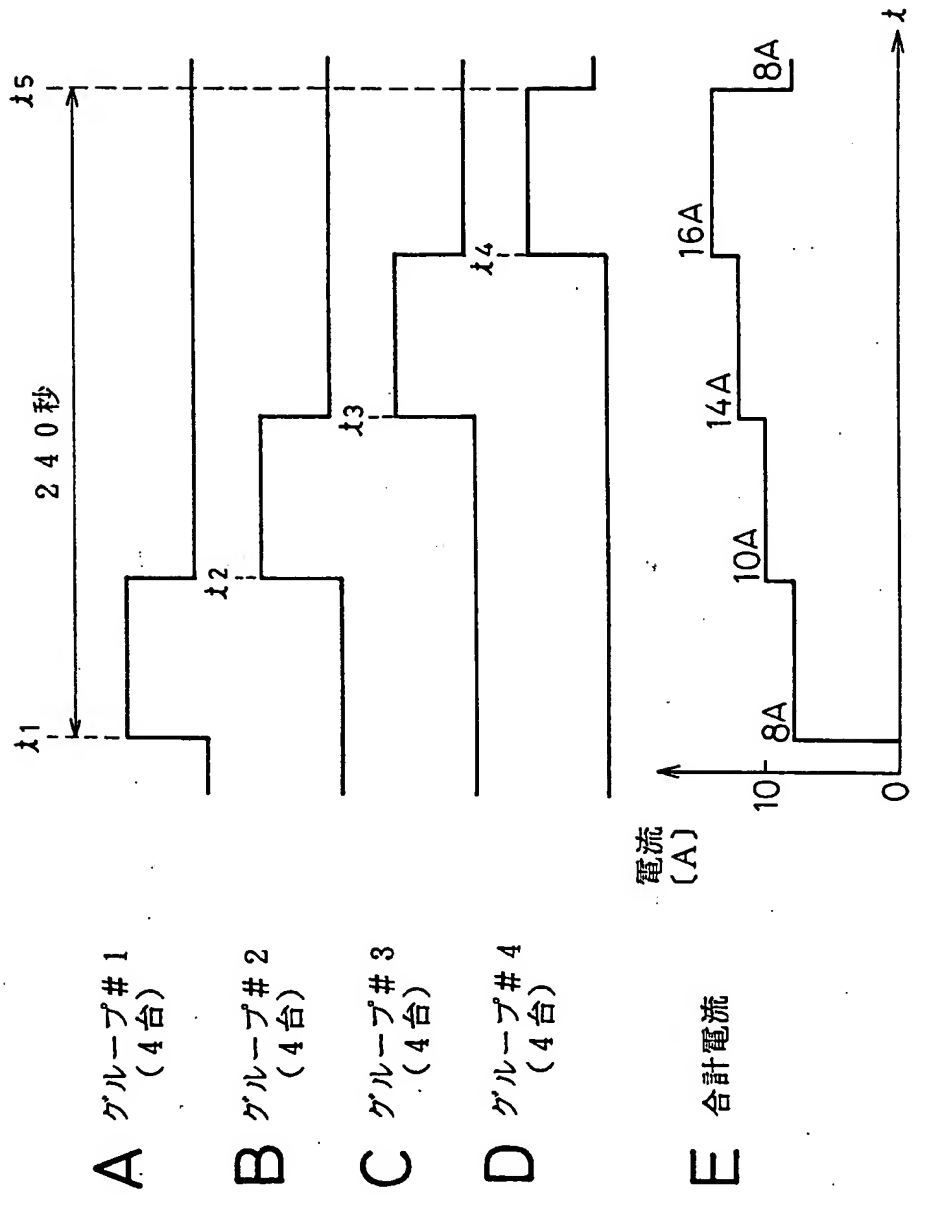
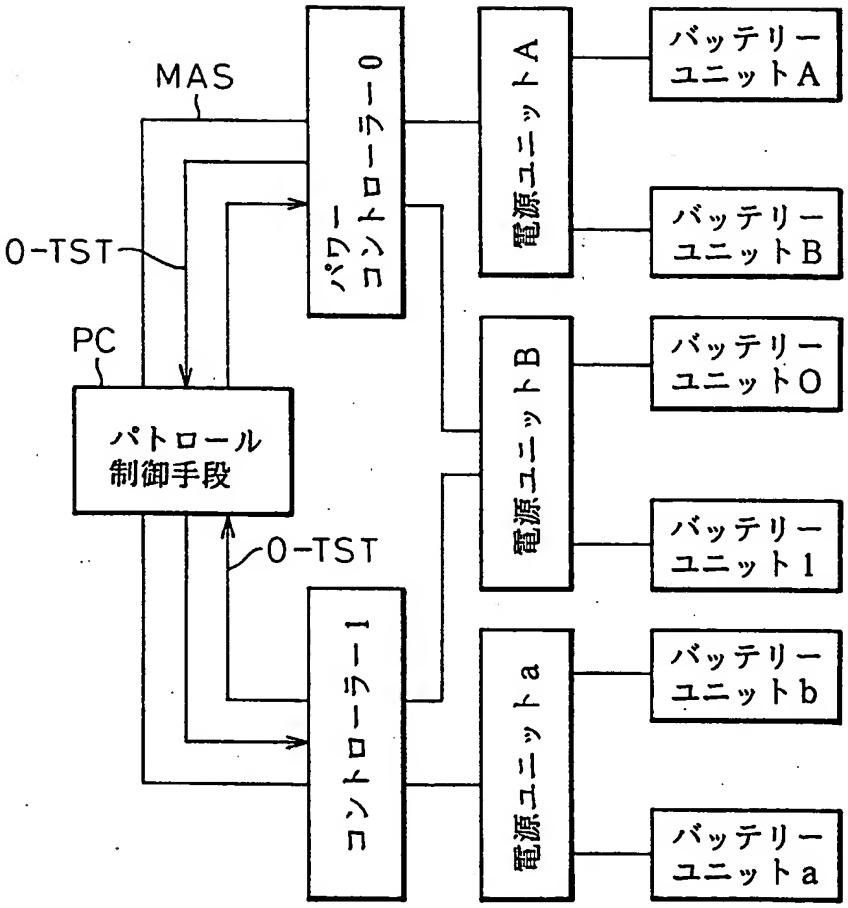

t5
240秒
t1
t2
t3
t4
A グループ#1 (4台)
B グループ#2 (4台)
C グループ#3 (4台)
D グループ#4 (4台)
E 合計電流
電流〔A〕
8A
16A
14A
10A
8A
10
0
t

Fig.32

Fig.33


MAS
0-TST
PC
パトロール
制御手段
0-TST
パワー
コントローラー0
コントローラー1
電源ユニットA
電源ユニットB
電源ユニットa
バッテリー
ユニットA
バッテリー
ユニットB
バッテリー
ユニット0
バッテリー
ユニット1
バッテリー
ユニットb
バッテリー
ユニットa

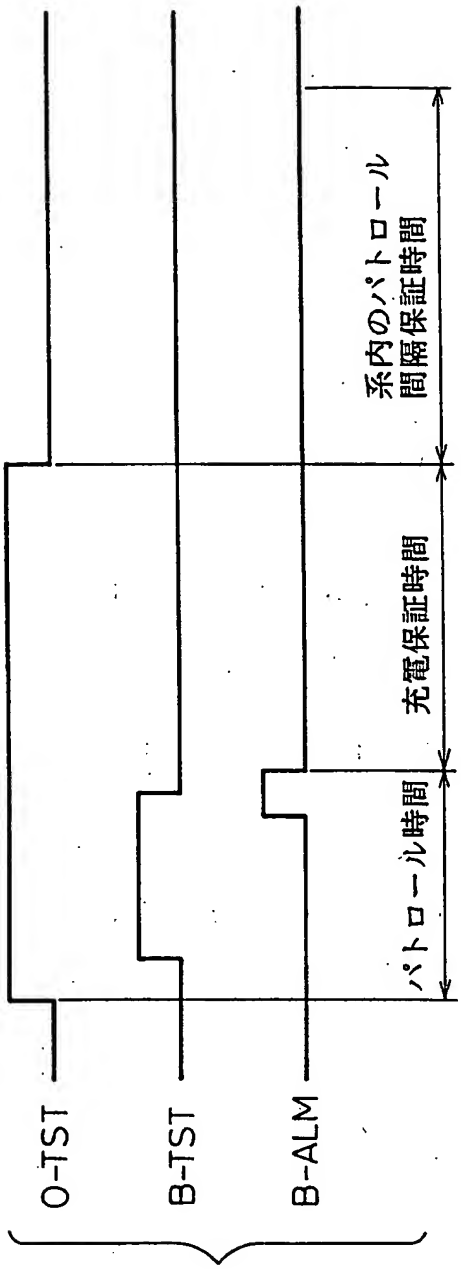


Fig. 34

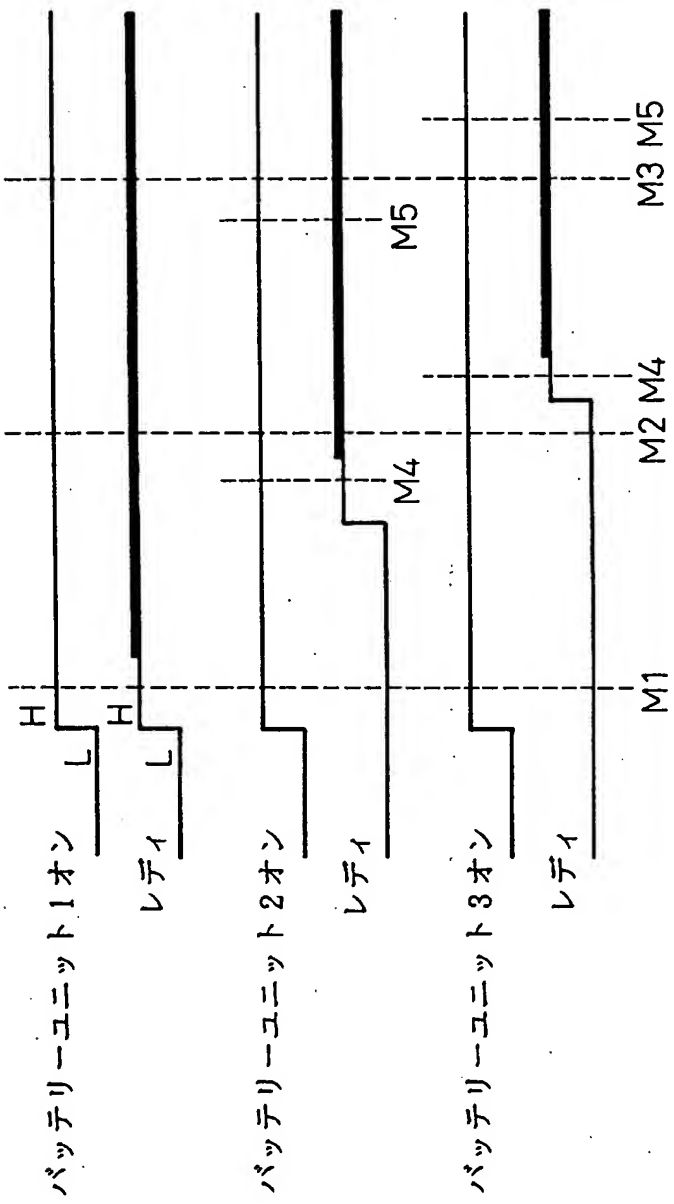

M1
M2 M4
M3 M5
M4
M5
H
L
H
L
バッテリーユニット1オン
レディ
バッテリーユニット2オン
レディ
バッテリーユニット3オン
レディ

Fig. 35

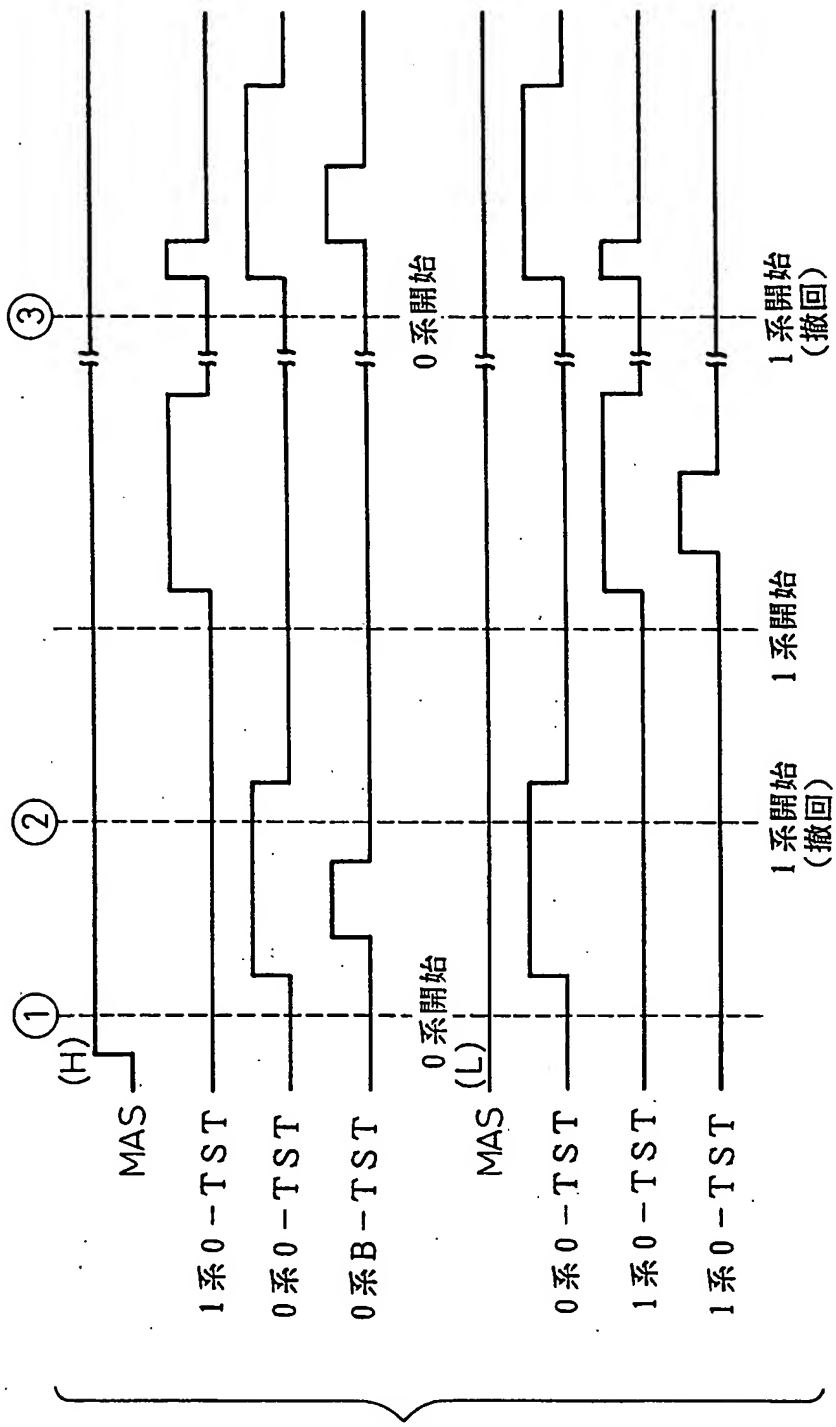

①
②
③
(H)
MAS
1系0−TST
0系0−TST
0系B−TST
0系開始
(L)
MAS
0系0−TST
1系0−TST
1系0−TST
1系開始
(撤回)
1系開始
1系開始
(撤回)

Fig.36

Fig.37

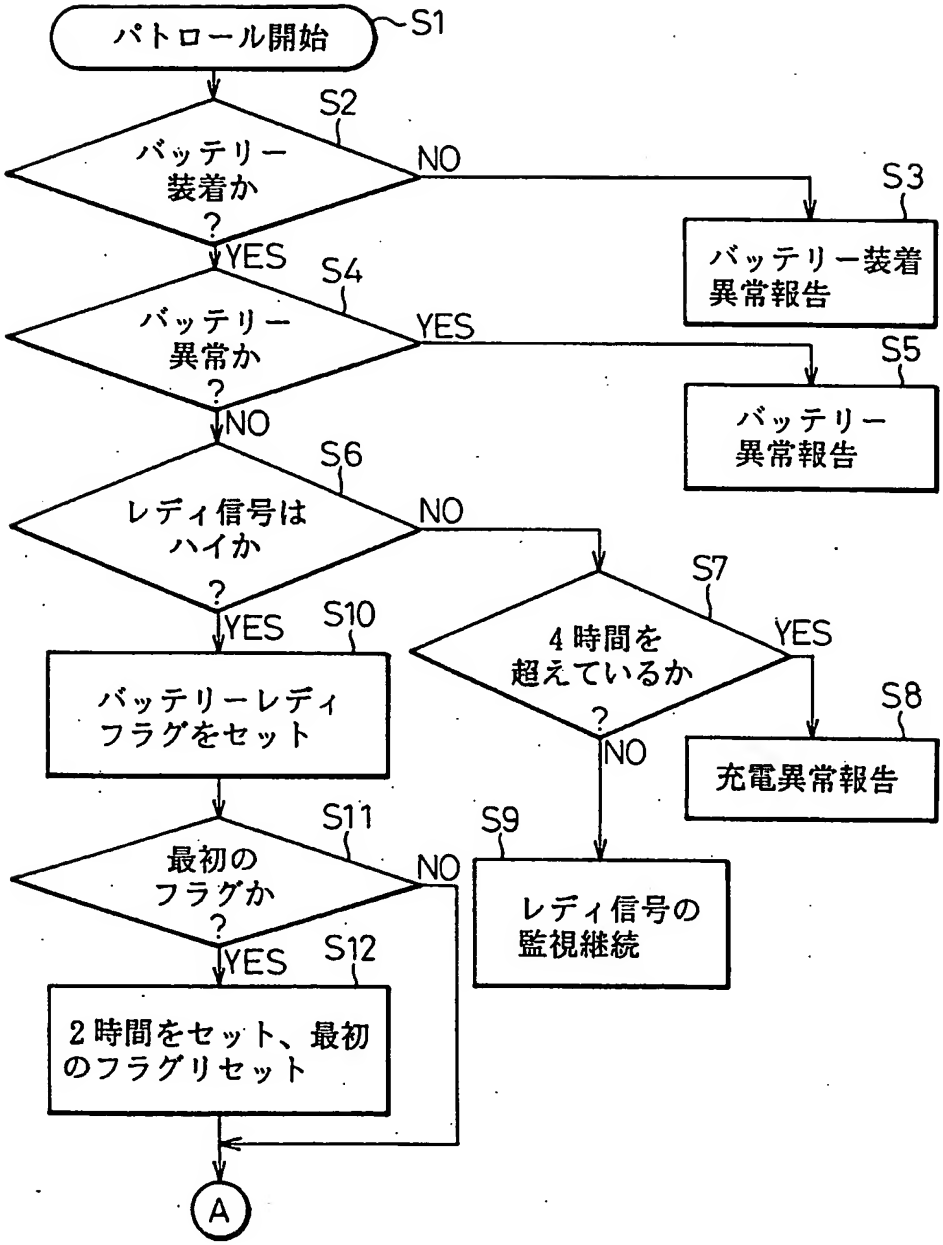

パトロール開始
S1
S2
バッテリー装着か？
NO
S3
バッテリー装着異常報告
YES
S4
バッテリー異常か？
YES
S5
バッテリー異常報告
NO
S6
レディ信号はハイか？
NO
S7
4時間を超えているか？
YES
S8
充電異常報告
NO
S9
レディ信号の監視継続
YES
S10
バッテリーレディフラグをセット
S11
最初のフラグか？
NO
YES
S12
2時間をセット、最初のフラグリセット
A

Fig.38

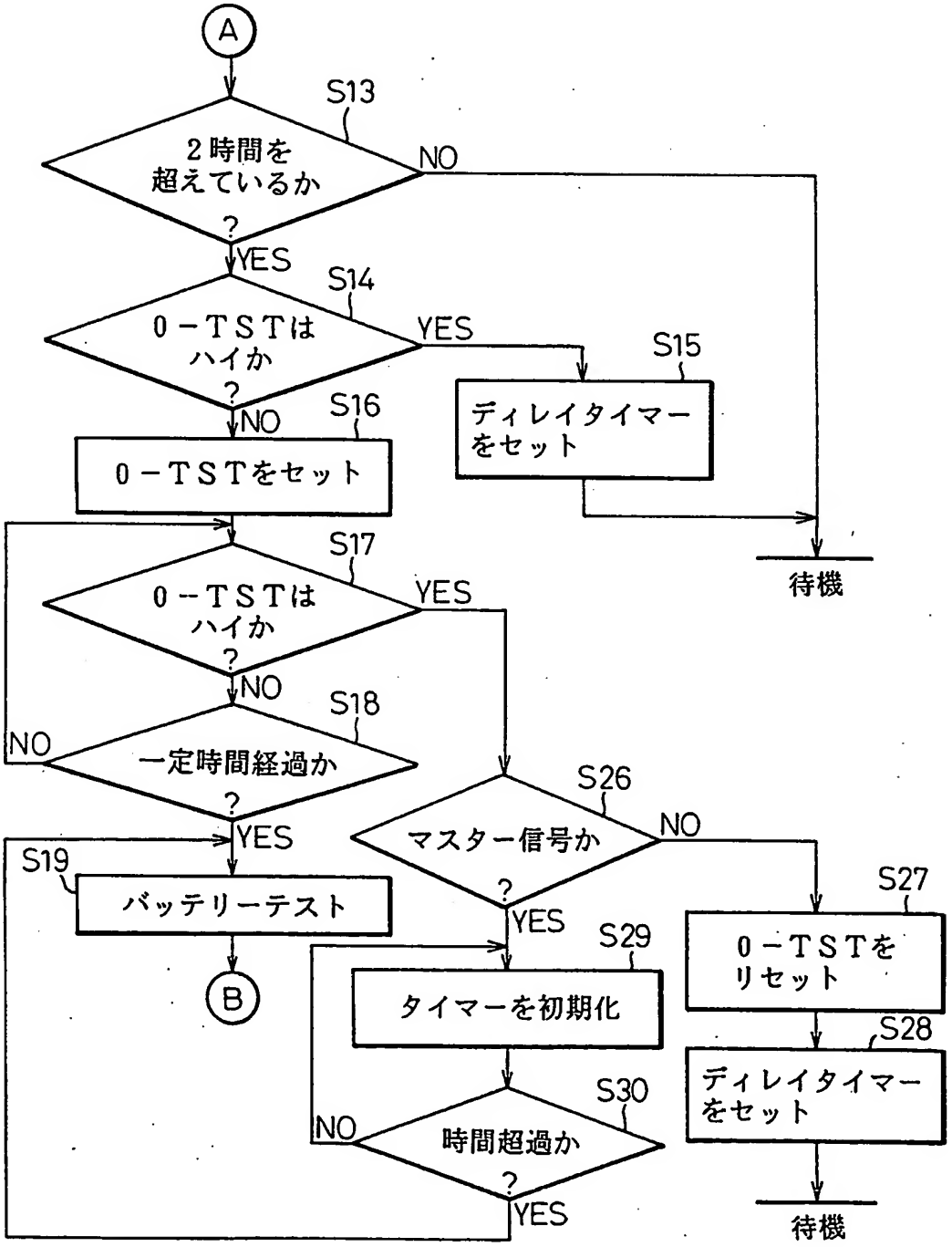

A
S13
2時間を超えているか
?
NO
YES
S14
0－TSTはハイか
?
YES
S15
ディレイタイマーをセット
NO
S16
0－TSTをセット
待機
S17
0－TSTはハイか
?
YES
NO
S18
一定時間経過か
?
NO
YES
S19
バッテリーテスト
B
S26
マスター信号か
?
NO
YES
S27
0－TSTをリセット
S28
ディレイタイマーをセット
待機
S29
タイマーを初期化
S30
時間超過か
?
NO
YES

Fig.39

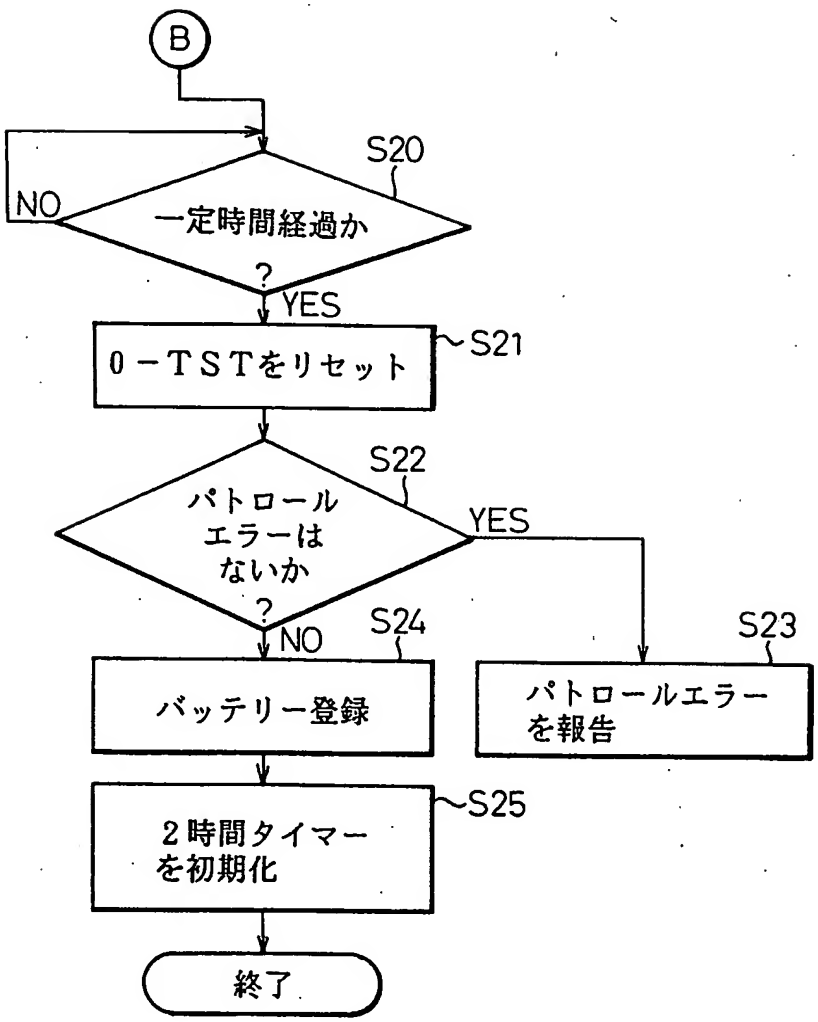
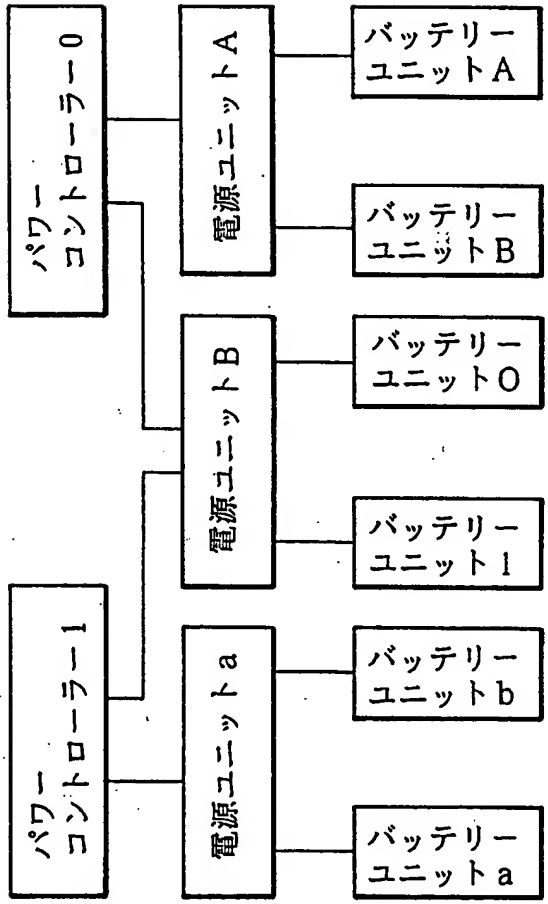

B
S20
NO
一定時間経過か
?
YES
0－TSTをリセット
S21
S22
パトロール
エラーは
ないか
?
YES
NO
S24
S23
バッテリー登録
パトロールエラー
を報告
2時間タイマー
を初期化
S25
終了

Fig.40


パワーコントローラー0
電源ユニットA
バッテリーユニットA
バッテリーユニットB
電源ユニットB
バッテリーユニットO
バッテリーユニットl
パワーコントローラー1
電源ユニットa
バッテリーユニットb
バッテリーユニットa

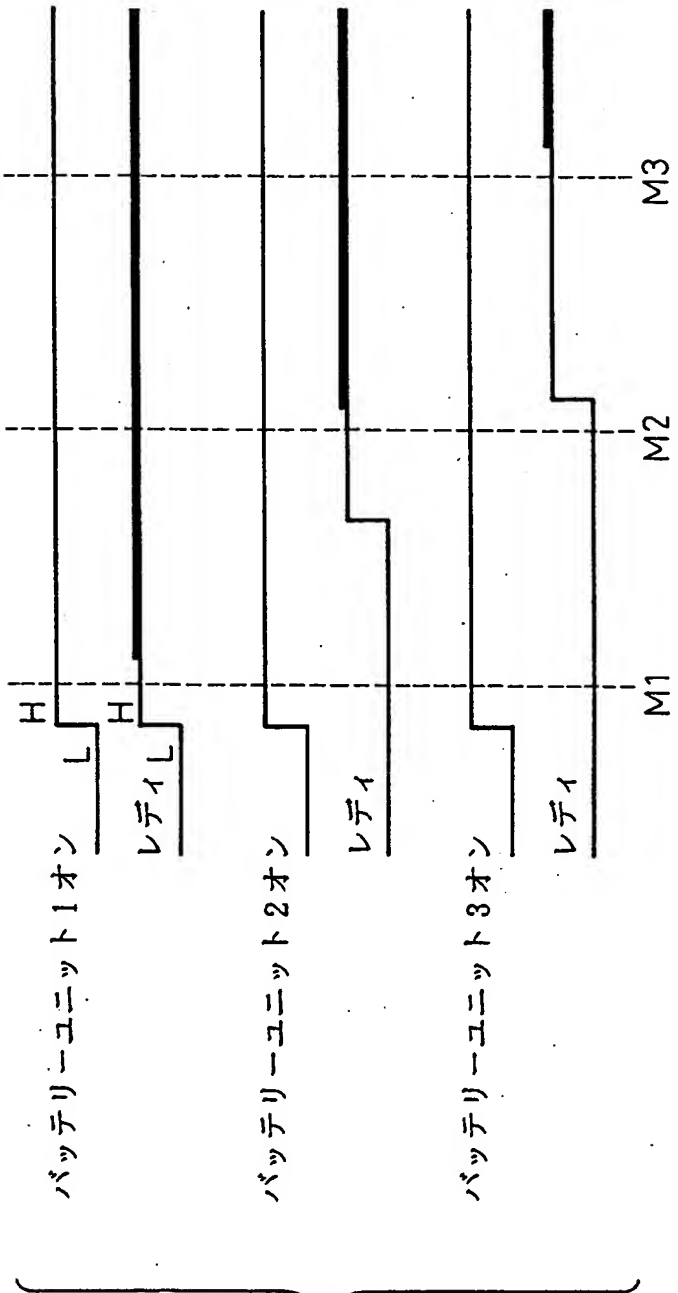

M3
M2
M1
H
L
H
L
バッテリーユニット1オン
レディ
バッテリーユニット2オン
レディ
バッテリーユニット3オン
レディ

Fig. 41

Fig.42

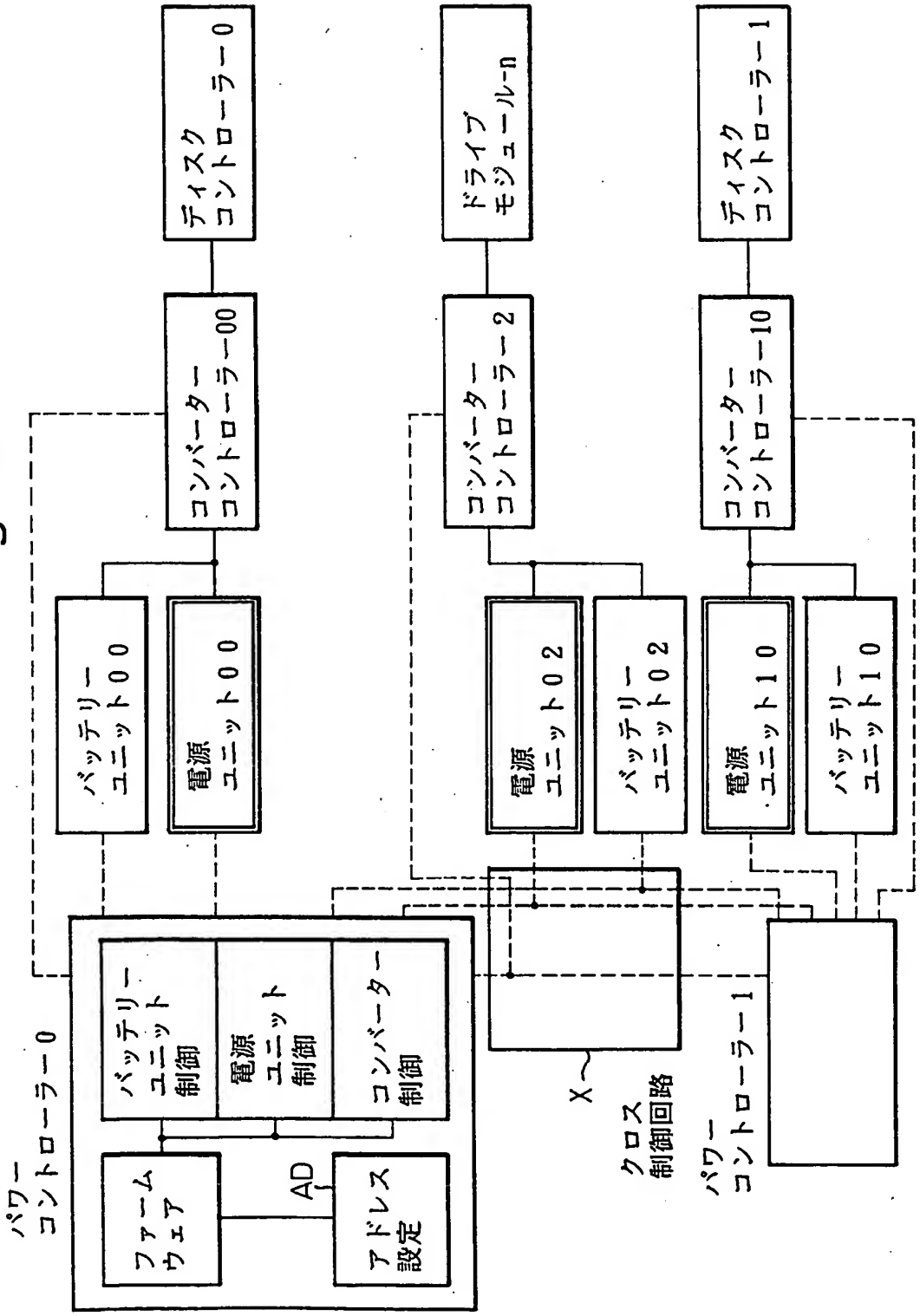

ディスク
コントローラー0
ドライブ
モジュール-n
ディスク
コントローラー1
コンバーター
コントローラー00
コンバーター
コントローラー2
コンバーター
コントローラー10
バッテリー
ユニット00
電源
ユニット00
電源
ユニット02
バッテリー
ユニット02
電源
ユニット10
バッテリー
ユニット10
パワー
コントローラー0
バッテリー
ユニット
制御
電源
ユニット
制御
コンバーター
制御
ファーム
ウェア
AD
アドレス
設定
X
クロス
制御回路
パワー
コントローラー1

Fig.43

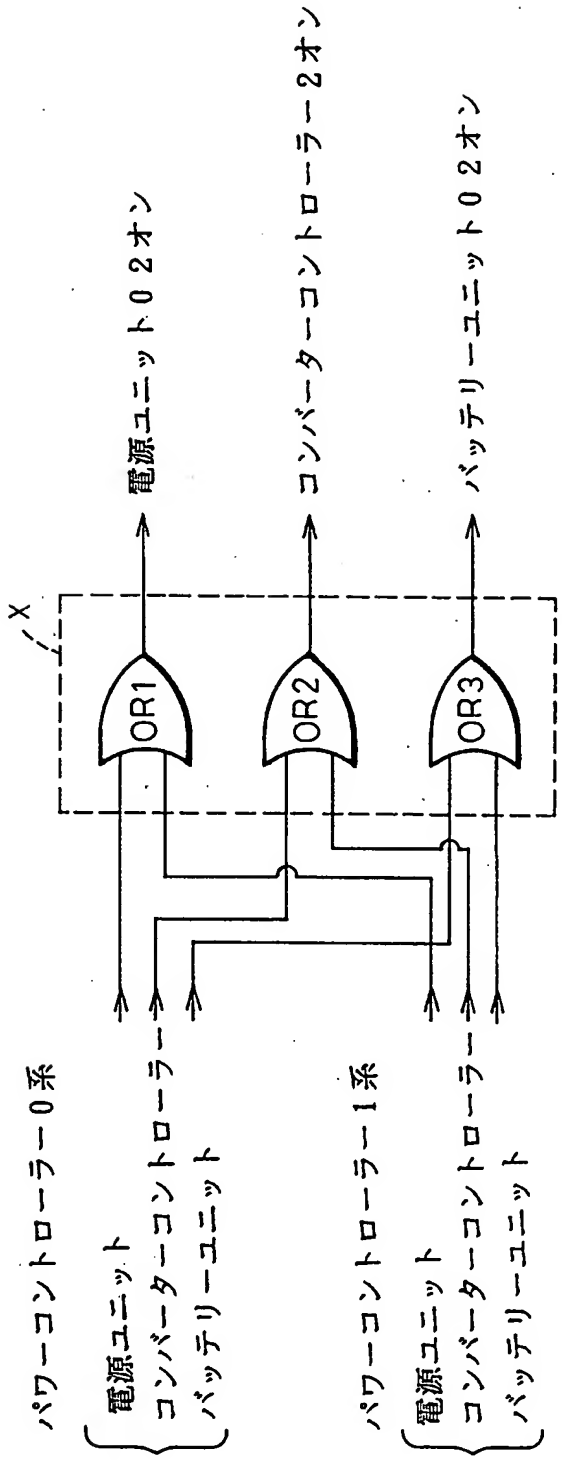

X
OR1
OR2
OR3
電源ユニットO2オン
コンバーターコントローラー2オン
バッテリーユニットO2オン
パワーコントローラー0系
電源ユニット
コンバーターコントローラー
バッテリーユニット
パワーコントローラー1系
電源ユニット
コンバーターコントローラー
バッテリーユニット

Fig.44

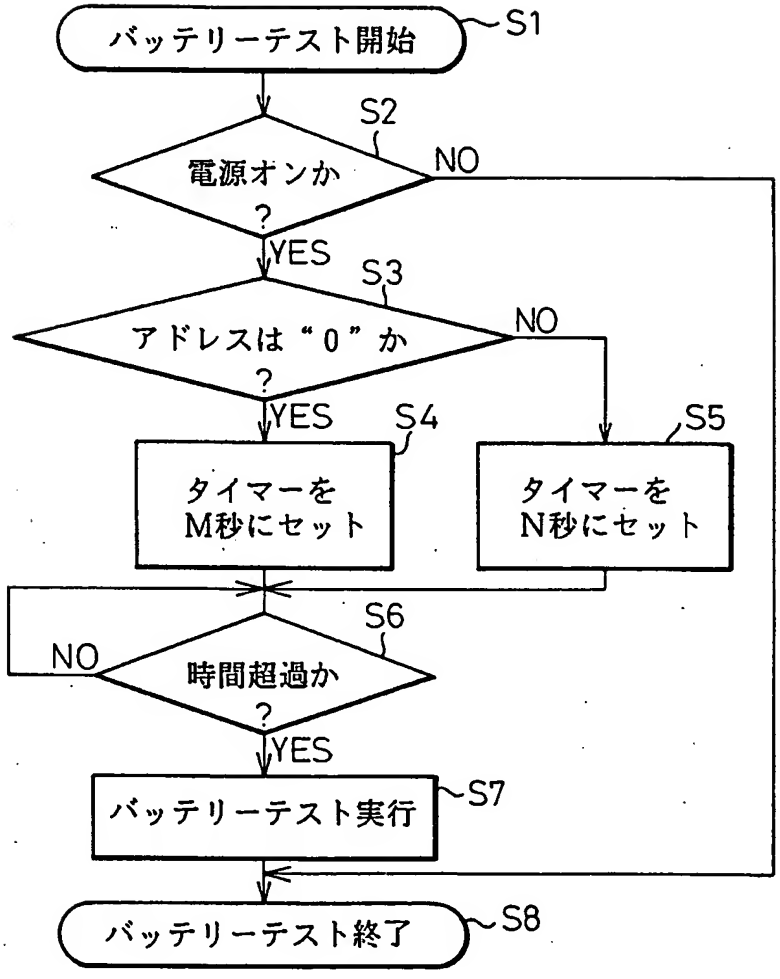

バッテリーテスト開始
S1
S2
電源オンか？
NO
YES
S3
アドレスは“0”か？
NO
YES
S4
タイマーをM秒にセット
S5
タイマーをN秒にセット
S6
NO
時間超過か？
YES
バッテリーテスト実行
S7
バッテリーテスト終了
S8

Fig.45

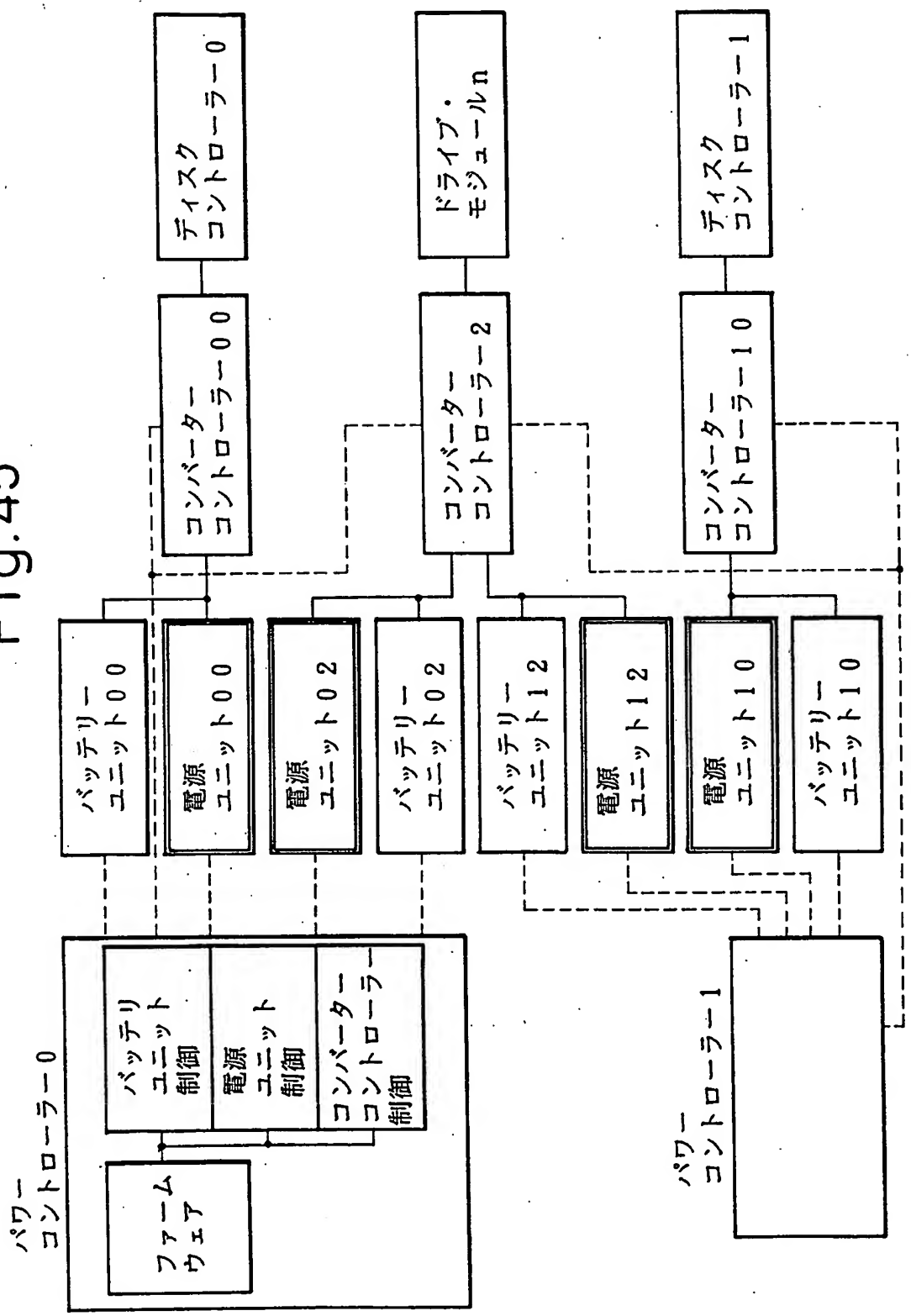

ディスク
コントローラー0
ドライブ・
モジュールn
ディスク
コントローラー1
コンバーター
コントローラー00
コンバーター
コントローラー2
コンバーター
コントローラー10
バッテリー
ユニット00
電源
ユニット00
電源
ユニット02
バッテリー
ユニット02
バッテリー
ユニット12
電源
ユニット12
電源
ユニット10
バッテリー
ユニット10
パワー
コントローラー0
バッテリ
ユニット
制御
電源
ユニット
制御
コンバーター
コントローラー
制御
ファーム
ウェア
パワー
コントローラー1

Fig.46

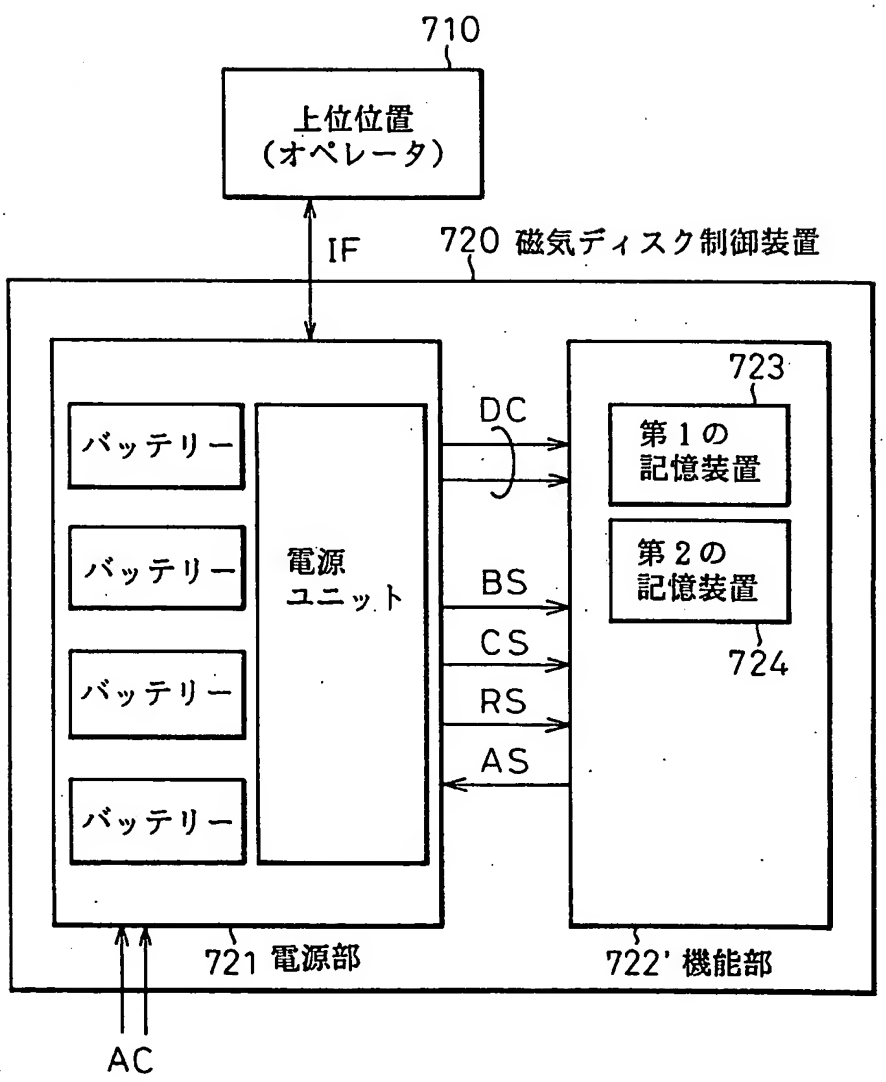

710
上位位置
(オペレータ)
IF
720 磁気ディスク制御装置
バッテリー
バッテリー
バッテリー
バッテリー
電源
ユニット
DC
BS
CS
RS
AS
723
第1の
記憶装置
第2の
記憶装置
724
721 電源部
722' 機能部
AC

Fig. 47

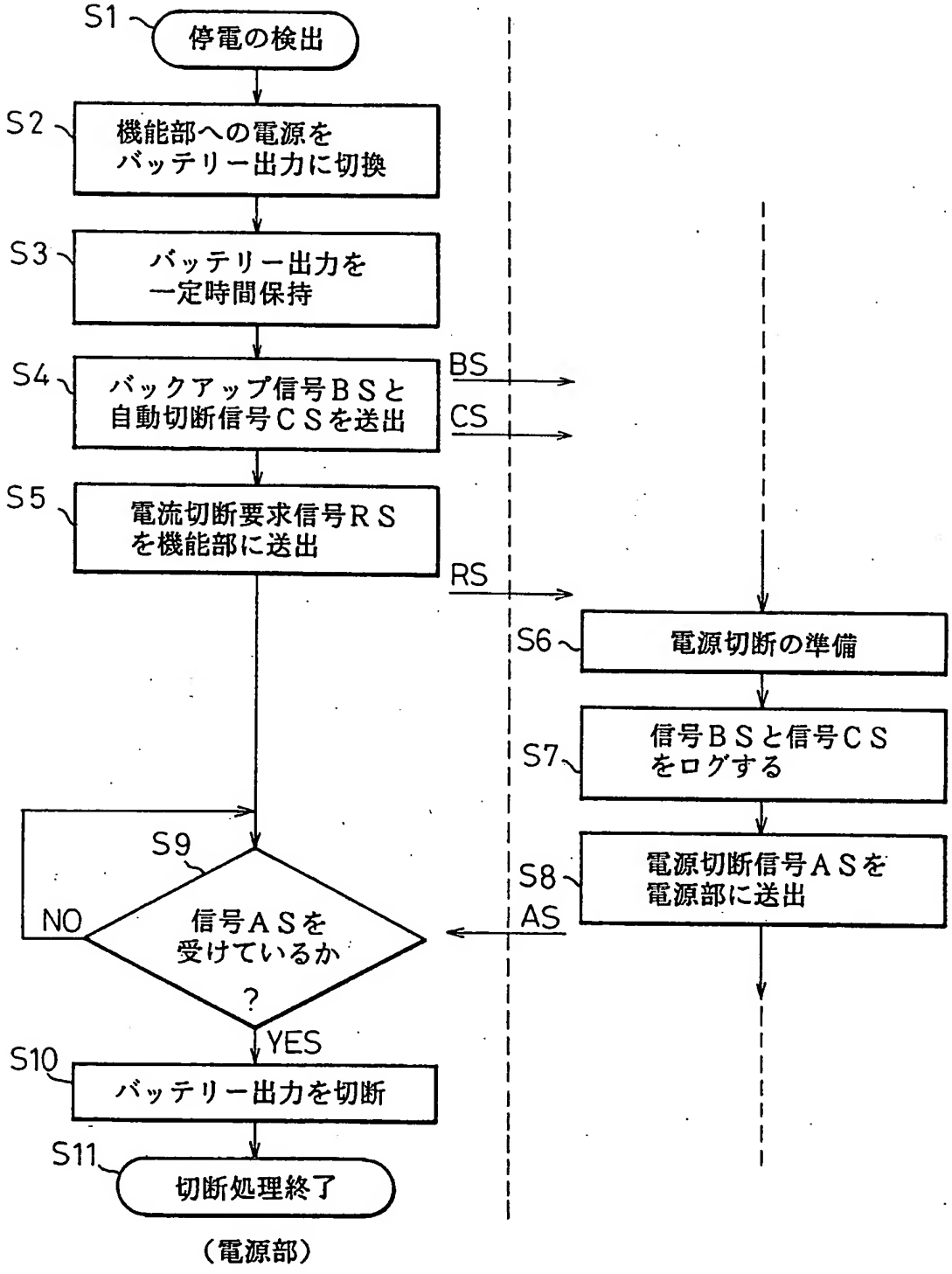

S1
停電の検出
S2
機能部への電源を
バッテリー出力に切換
S3
バッテリー出力を
一定時間保持
S4
バックアップ信号ＢＳと
自動切断信号ＣＳを送出
BS
CS
S5
電流切断要求信号ＲＳ
を機能部に送出
RS
S6
電源切断の準備
S7
信号ＢＳと信号ＣＳ
をログする
S8
電源切断信号ＡＳを
電源部に送出
AS
S9
NO
信号ＡＳを
受けているか
？
YES
S10
バッテリー出力を切断
S11
切断処理終了
（電源部）

Fig.48

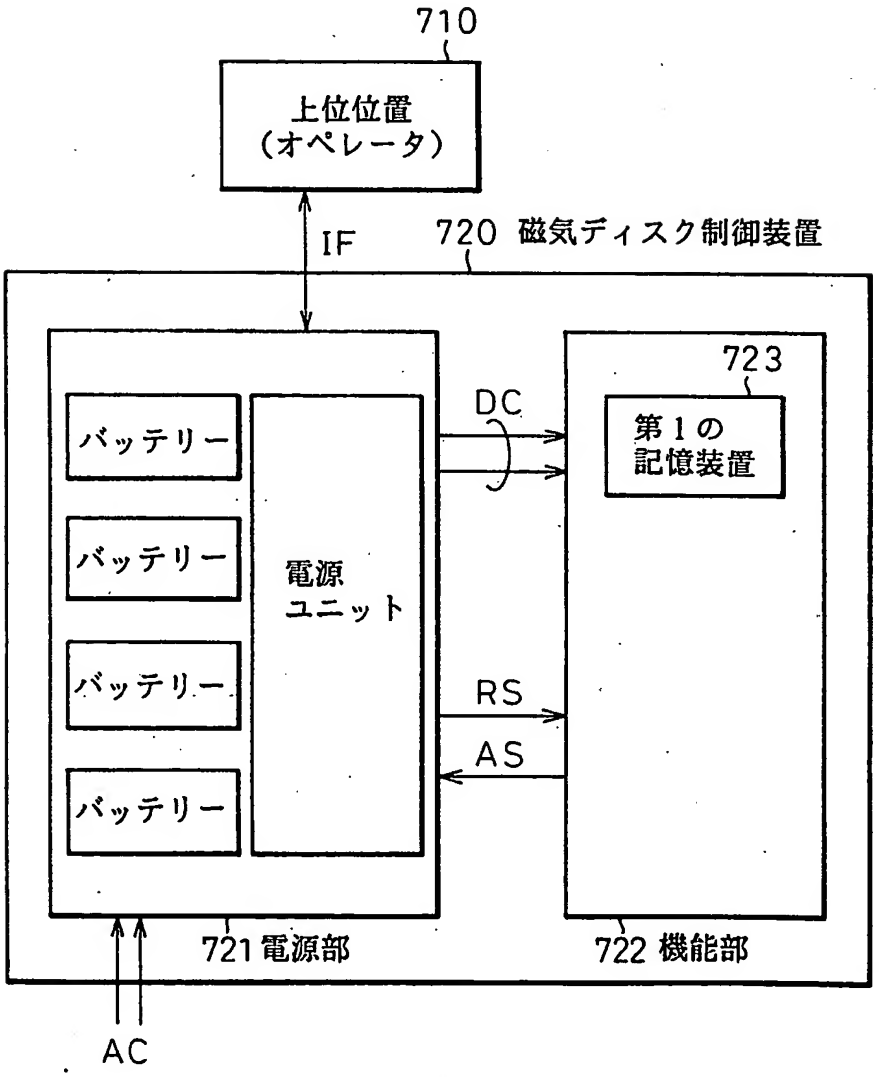

710
上位位置
(オペレータ)
IF
720 磁気ディスク制御装置
723
バッテリー
バッテリー
バッテリー
バッテリー
電源
ユニット
DC
第1の
記憶装置
RS
AS
721 電源部
722 機能部
AC

Fig. 49

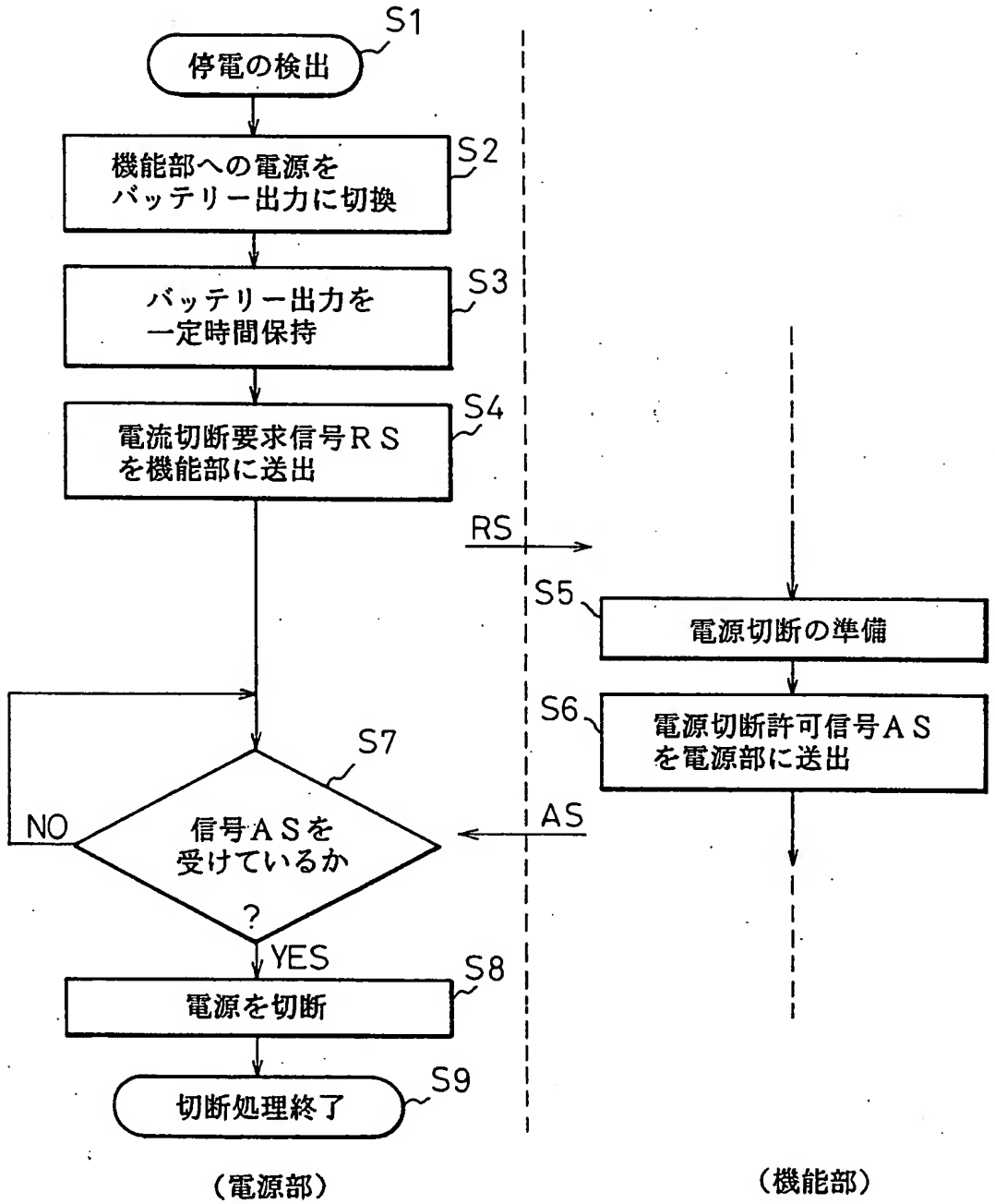

S1
停電の検出
S2
機能部への電源を
バッテリー出力に切換
S3
バッテリー出力を
一定時間保持
S4
電流切断要求信号ＲＳ
を機能部に送出
RS
S5
電源切断の準備
S6
電源切断許可信号ＡＳ
を電源部に送出
AS
S7
NO
信号ＡＳを
受けているか
?
YES
S8
電源を切断
S9
切断処理終了
（電源部）
（機能部）

Fig.50

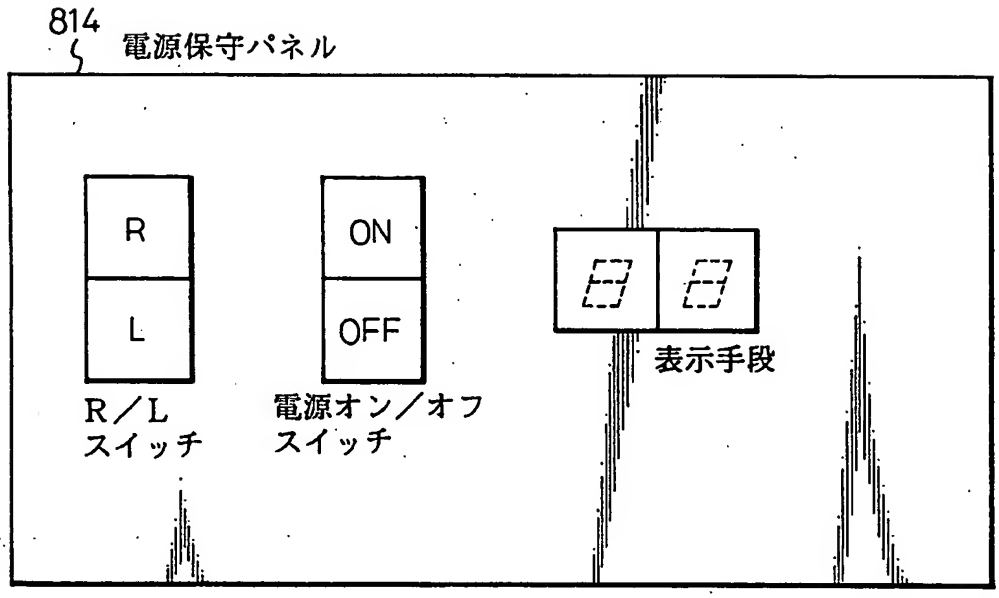


Fig.51

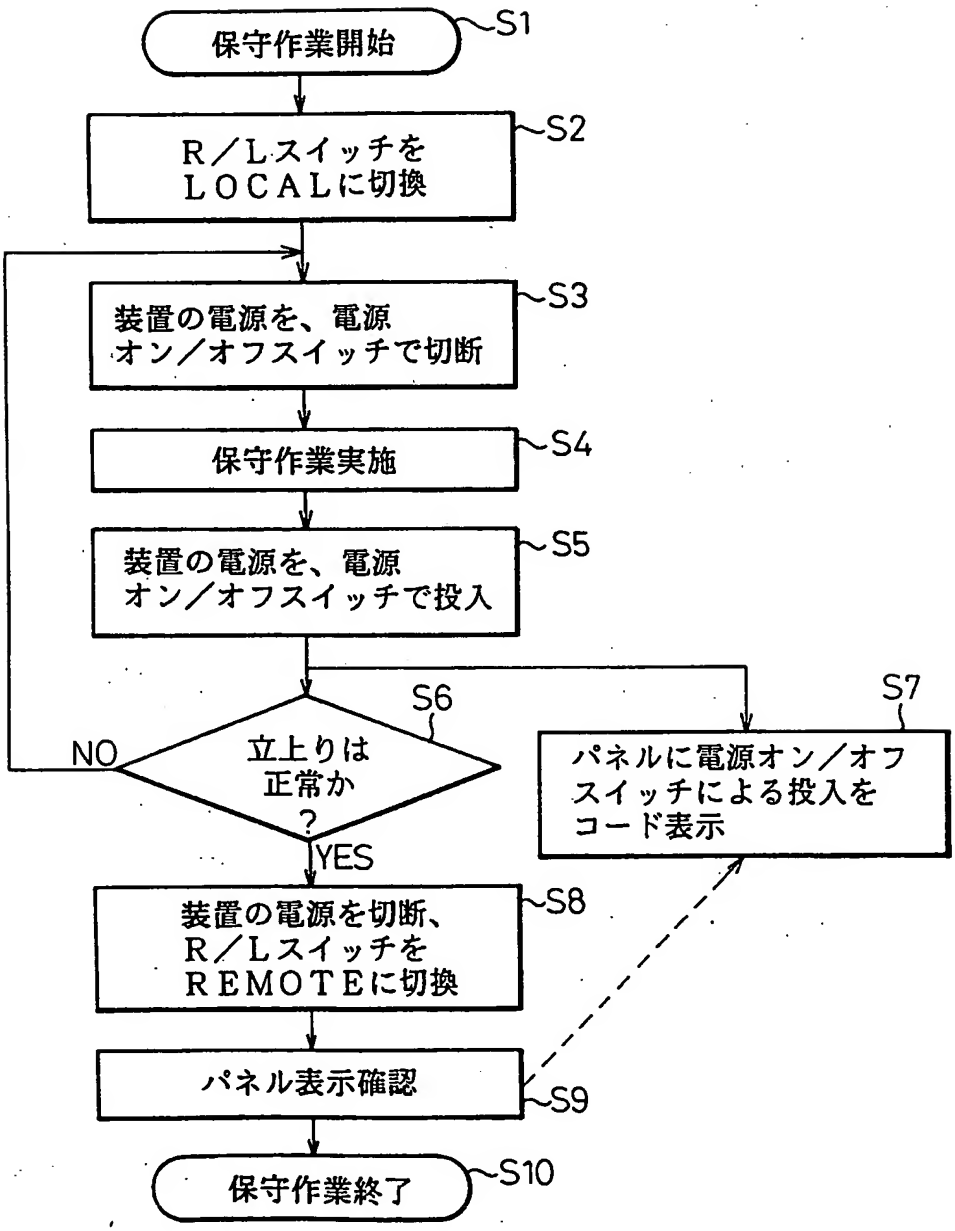

保守作業開始
S1
R／Lスイッチを
LOCALに切換
S2
装置の電源を、電源
オン／オフスイッチで切断
S3
保守作業実施
S4
装置の電源を、電源
オン／オフスイッチで投入
S5
S6
立上りは
正常か
？
NO
YES
S7
パネルに電源オン／オフ
スイッチによる投入を
コード表示
装置の電源を切断、
R／Lスイッチを
REMOTEに切換
S8
パネル表示確認
S9
保守作業終了
S10

Fig.52

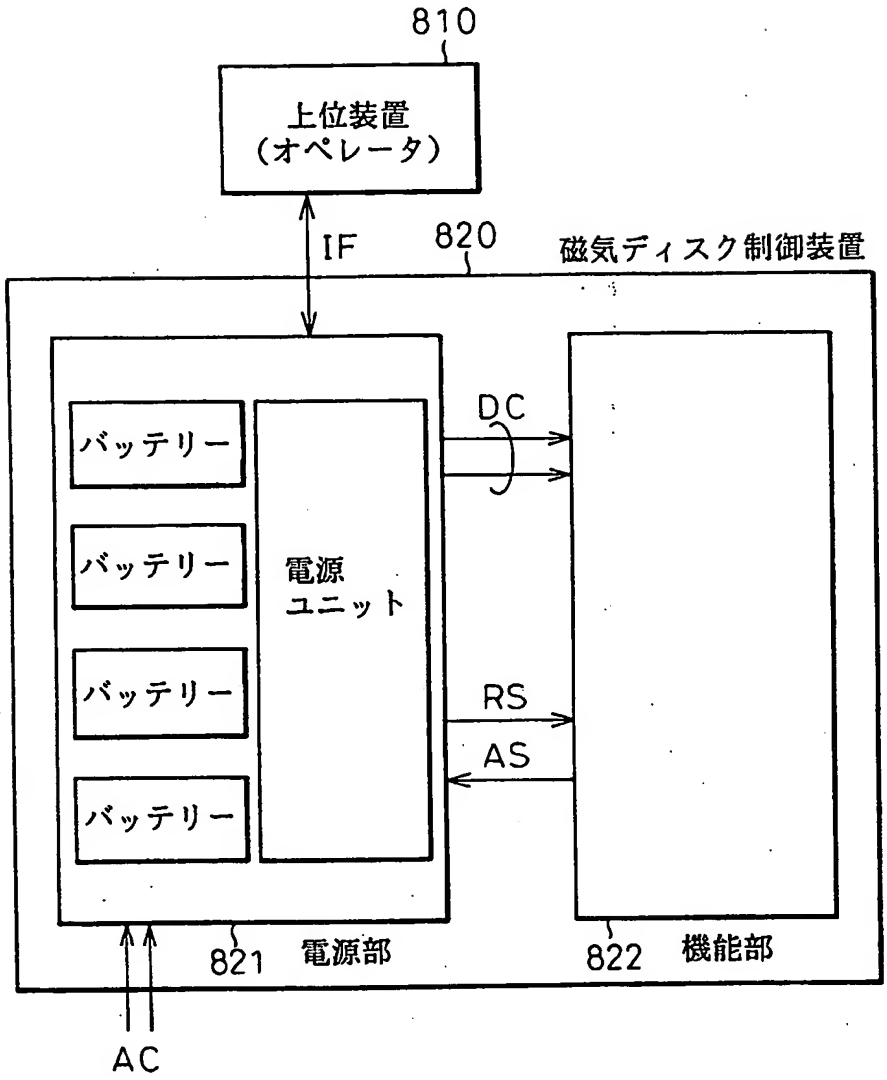

810
上位装置
(オペレータ)
IF
820
磁気ディスク制御装置
バッテリー
バッテリー
バッテリー
バッテリー
電源
ユニット
DC
RS
AS
821
電源部
822
機能部
AC

Fig.53

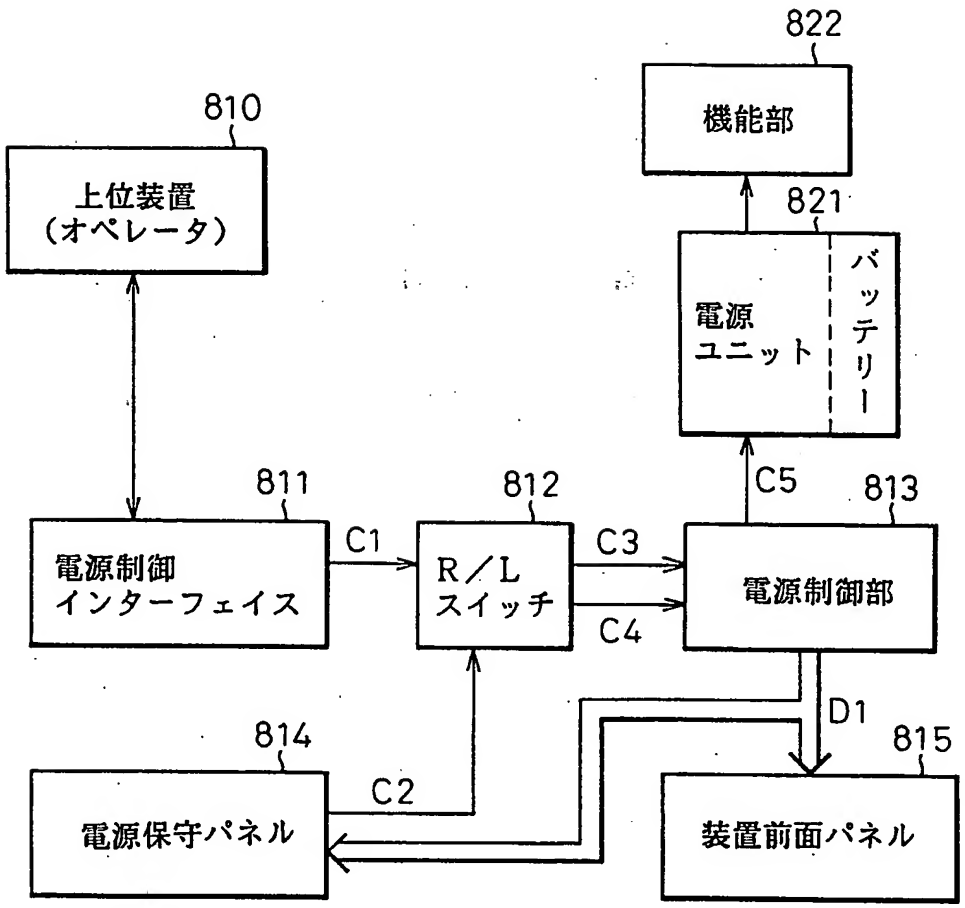

822
機能部
810
上位装置
(オペレータ)
821
電源
ユニット
バッテリー
811
812
C5
813
C1
C3
電源制御
インターフェイス
R/L
スイッチ
電源制御部
C4
D1
814
815
C2
電源保守パネル
装置前面パネル

Fig.54

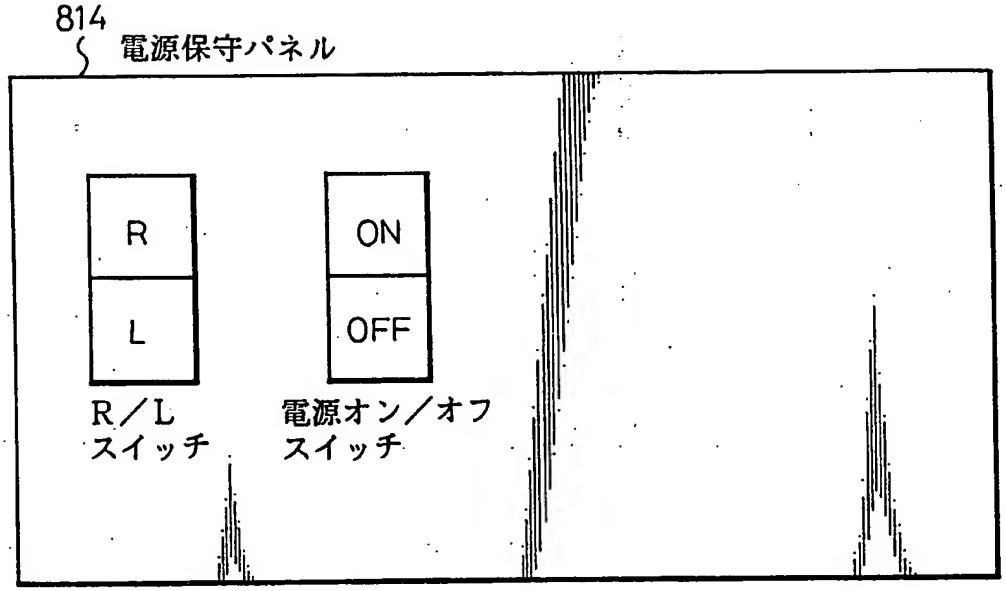


Fig.55

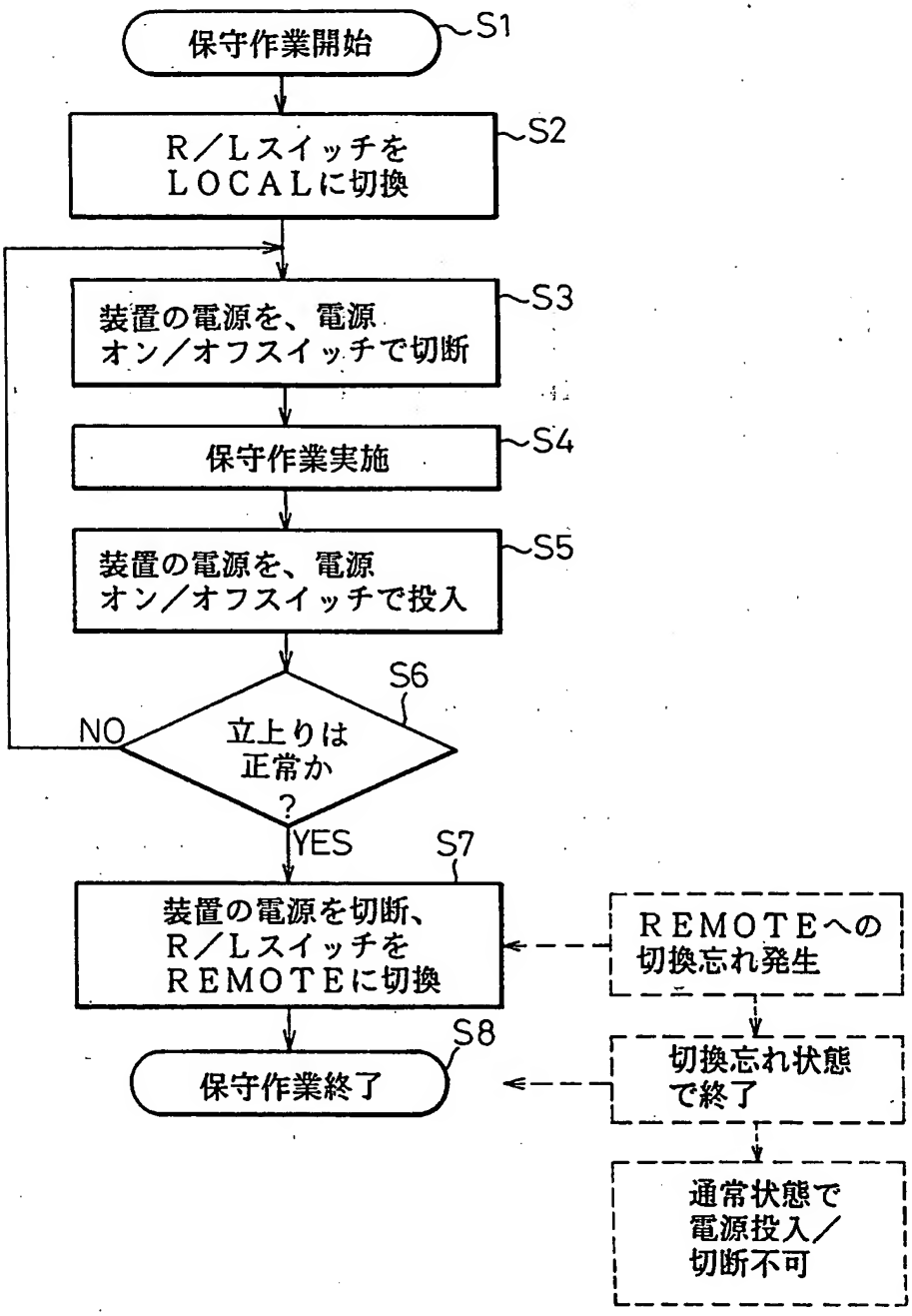
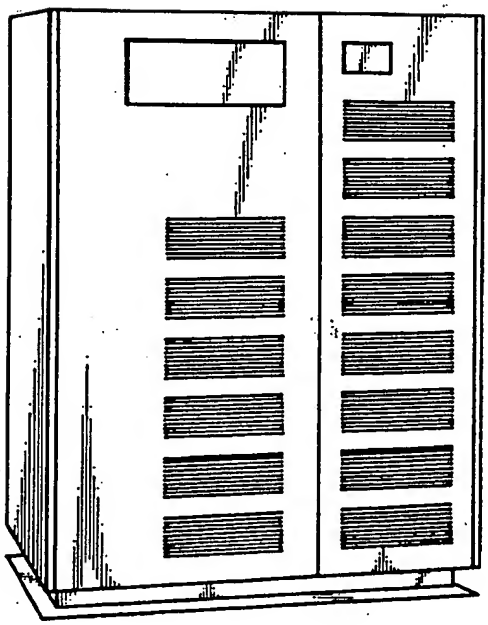

保守作業開始
S1
R／Lスイッチを
LOCALに切換
S2
装置の電源を、電源
オン／オフスイッチで切断
S3
保守作業実施
S4
装置の電源を、電源
オン／オフスイッチで投入
S5
S6
立上りは
正常か
？
NO
YES
S7
装置の電源を切断、
R／Lスイッチを
REMOTEに切換
S8
保守作業終了
REMOTEへの
切換忘れ発生
切換忘れ状態
で終了
通常状態で
電源投入／
切断不可

Fig.56



磁気ディスク装置

参照符号の一覧表

110,210 …パワーコントローラー

112,212,312 …電源ユニット（AC／DCコンバーター）

114,214,314 …バッテリーユニット

116 …DC／DCコンバーター

120 …共用キャッシュメモリ

122 …上位インターフェース

124 …操作パネル

126 …IFコントローラー

132 …ノイズフィルター

134 …ブレーカ収納ボックス

136 …チャネルプロセッサ

138 …チャネル

140 …BMC インターフェース

142,218 …ディレクター

144 …ストリングコントローラー

146 …デバイスインターフェース

148,248,348 …磁気ディスク・モジュール

150 …ロッカー

152,318,720,820 …磁気ディスク制御装置

154 …制御用マザーボード

156 …インターフェース収納ボックス

158 …交流用引込みボックス

160 …電源用マザーボード

162 …ドライブ用マザーボード

180 …第1及び第2パワーコントロール部

182 …第1及び第2ドライブ部

186 …遅延手段

264, 364 …RAM

266, 366 …ROM

2100…スイッチ

2102…ダイオード

290 …充電電流検出回路

292 …安定化回路

2112…充電完了検出回路

2114…バッテリー異常検出回路

260, 360 …マイクロプロセッサ

275 …第1及び第2タイマー

300, 721, 821 …電源部

3100…バックアップ制御部

3102…停電検出部

3110, 710, 810…上位装置

723 …第1の記憶装置

724 …第2の記憶装置

811 …電源制御インターフェース

812 …R／Lスイッチ

814 …電源保守パネル

815 …装置前面パネル

OR1－OR3…ORゲート

AD…アドレス設定回路

PC…パトロール制御部

X…クロス制御回路

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP93/00703

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^5 G06F3/06, G06F1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^5 G06F3/06, G06F1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1926 - 1993
Kokai Jitsuyo Shinan Koho 1971 - 1993

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, A, 60-8914 (Fujitsu Ltd.), January 17, 1985 (17. 01. 85), (Family: none)	1-41
A	JP, A, 61-151724 (Pitney Bowes Inc.), July 10, 1986 (10. 07. 86), & EP, A, 186881 & US, A, 4649491	1-7
A	JP, A, 2-181210 (Hitachi, Ltd. and another), July 16, 1990 (16. 07. 90), (Family: none)	9-41
A	JP, A, 2-159932 (Fujitsu Ltd.), June 20, 1990 (20. 06. 90), (Family: none)	9-41

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
July 15, 1993 (15. 07. 93)	August 3, 1993 (03. 08. 93)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

国際調査報告

国際出願番号 PCT/JP 93/00703

A. 発明の属する分野の分類（国際特許分類（IPC））

Int. Cl[5] G06F3/06, G06F1/00

B. 調査を行った分野

調査を行った最小限資料（国際特許分類（IPC））

Int. Cl[5] G06F3/06, G06F1/00

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報 1926－1993年
日本国公開実用新案公報 1971－1993年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C. 関連すると認められる文献

引用文献のカテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
A	JP, A, 60－8914（富士通株式会社） 17. 1月. 1985（17. 01. 85）（ファミリーなし）	1－41
A	JP, A, 61－151724（ピットネイ・ボウズ・インコーポレーテッド） 10. 7月. 1986（10. 07. 86） &EP, A, 186881 &US, A, 4649491	1－7
A	JP, A, 2－181210（株式会社 日立製作所, 他1名）	9－41

☑ C欄の続きにも文献が列挙されている。

☐ パテントファミリーに関する別紙を参照。

* 引用文献のカテゴリー
「A」特に関連のある文献ではなく、一般的技術水準を示すもの
「E」先行文献ではあるが、国際出願日以後に公表されたもの
「L」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「O」口頭による開示、使用、展示等に言及する文献
「P」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「T」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「&」同一パテントファミリー文献

国際調査を完了した日
15. 07. 93

国際調査報告の発送日
03.08.93

名称及びあて先
日本国特許庁（ISA/JP）
郵便番号100
東京都千代田区霞が関三丁目4番3号

特許庁審査官（権限のある職員）
祖父江 栄一 5B 7165

電話番号 03－3581－1101 内線 3545

様式PCT/ISA/210（第2ページ）（1992年7月）

C（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
A	16．7月．1990（16．07．90）（ファミリーなし） JP，A，2－159932（富士通株式会社） 20．6月．1990（20．06．90）（ファミリーなし）	9－41

JP 3242407 B

EQUIVALENT WO 93/24878

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

---

(57) [Claim(s)]
[Claim 1] In the magnetic disk drive which has the power supply unit which has the dc-battery unit which has a power supply unit to two or more each, and accompanies this power supply unit, and is common in an other system, and the dc-battery which accompanies this Between the power control (0) of one system, and the power control (1) of the system of another side It has the patrol control means (PC) which gives priority to the signal and dc-battery monitor under dc-battery monitor actuation. Each of said power control If it detects that the ready state of a dc-battery is supervised and it is in the ready state which can back up a dc-battery in case the dc-battery which accompanies the power supply unit which is common in said other system is supervised Start monitor actuation of the dc-battery concerned immediately, and if the dc-battery function is appropriate When performing inclusion to the system of the dc-battery concerned and performing monitor actuation of the dc-battery with which self-equipment accompanies further the power supply unit which is common in said other system The master signal (MAS) which shows that is sent out to said patrol control means. Said patrol control means The other-system patrol signal (O-TST) which shows a working thing is sent out. the monitor of the dc-battery which accompanies the power supply unit with which the power control of other systems is common in said other system to the near power control which has not received said master signal -- And the magnetic disk drive characterized by what it faces including in a magnetic disk drive, and the coincidence monitor of a dc-battery and the inclusion timing to the magnetic disk drive of a dc-battery are controlled for.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
Technical field This invention relates to the control system of the miniaturization and densification of a magnetic disk drive which are especially used as a subsystem in a medium size host computer system, and the built-in power source for backup about the magnetic disk drive used as a subsystem of a computer system. In a concrete target, it is more. Set to the above-mentioned magnetic disk drive, concerning the internal structure for the miniaturization of the locker mold magnetic disk drive having two or more power sources for backup and disk storage control other than a disk storage module, and densification. It is further related with the display of the power-source condition in a magnetic disk drive etc. about the powering-off control in disk storage control, concerning the power-source monitor for carrying out change-over control of the dc-battery for backup which accompanies the system of both one system and the system of another side at the time of interruption of service, concerning the starting approach of two or more disk storage modules in the above-mentioned magnetic disk drive, concerning the backup control system of the current supply from a dc-battery unit.
Background technique Although the demand to the dependability of a computer system is very high, even when interruption of service by external factors, such as a failure of a power-source facility of a computer system or a thunderbolt, occurs, and even when a power-source halt more than the system which can continue system behavior normally, and an allowed value occurs, the system which can complete the processing under activation normally, the system which can guarantee the data under writing to a magnetic disk drive further are demanded.
For this reason, also in the magnetic disk drive formed as a subsystem of a computer, the power control to which it can be efficient for and it can perform backup cheaply is required at the time of a halt of input power.
Generally, it connects with a large-scale computer system, for example, since 60-360 G bytes of magnetic disk drive is installed in the calculating-machine pin center,large completely equipped with the power-source facility with the large-scale computer system, it does not equip the magnetic disk drive itself with the dc-battery.
That is, a large-scale computer system and a magnetic disk drive receive an electric power supply from a common power-source facility. In this case, a power-source facility may be equipped with an external power and the dc-battery for backup, and may be further equipped with an emergency generator.
Generally, this dc-battery for backup is large capacity, the structure and the appearance of a dc-battery have various constraint based on a convention of Fire Service Law, therefore an installation tooth space becomes large.
5-20 G bytes of medium size magnetic disk drive is used for the medium size computer system installed in general office etc. on the other hand. In the case of such a medium size computer system, it did not have a full-scale power-source facility like a large-scale computer system, but the source power supply is used for it. Therefore, it is necessary to form the dc-battery for backup in the magnetic disk drive in this case.
By the way, in a medium size computer system, when it has a dc-battery for backup in a magnetic disk

drive, it is necessary to restrict to the power capacity of the range which makes the installation tooth space of a dc-battery as small as possible, and does not receive constraint by convention of Fire Service Law. On the other hand, however small the capacity of a dc-battery may be, backup of a power source is required and must be guaranteed. In this case, if interruption of service and hits continue, consumption (discharge) of a dc-battery is remarkable and charge does not fulfill demand, there is a possibility that the guarantee of the power-source backup to that system may become impossible.
Therefore, in the magnetic disk drive used for a medium size computer system, it is an important technical problem to hold down consumption of the dc-battery for backup as much as possible.
On the other hand, when the magnetic disk drive carries two or more disk storage modules miniaturized on structure and in one locker and start all modules all at once, a numbers of times [at the time of a stationary] as many current as this flows, and a power source with a big capacity is needed. Then, a work with which an inrush power source does not lap by starting a module in order is carried out.
However, in order to attain the miniaturization of a power-source facility further, finer starting control is desired.
Furthermore, it is necessary to improve the monitor of a power source, the test of a dc-battery, the factor analysis of powering off, the display of power-source maintenance, etc.
Indication of invention The 1st purpose of this invention is in amelioration of the internal mounting structure of a magnetic disk drive, is in the increase of the loading number of a disk storage module and the improvement in packaging density which are mounted in the housing (locker) of a magnetic disk drive, stops the amount of the cable used when forming two or more power supply units and the dc-battery unit for backup, disk storage control, etc., and is in the magnetic disk drive structure of the locker receipt mold which can mount high density.
Moreover, the 2nd purpose of this invention is to be able to be made to do powering off appropriately, without causing abnormal termination and data corruption of a system, even if it is in amelioration of the control at the time of interruption of service and interruption of service occurs before the completion of dc-battery charge.
Moreover, the 3rd purpose of this invention is in amelioration of backup control, and is for suitable backup control to be made to be made to equipment itself to a halt of the power-source input at the time of preparing a dc-battery unit.
Moreover, the 4th purpose of this invention is to also shorten makeup time at the same time it is in amelioration of the starting approach of a magnetic disk drive and suppresses a starting power source.
Moreover, the 5th purpose of this invention is in the monitor of a power source, especially a dc-battery, and prepares a power-source monitor time in timely, and controls the contention from two lines, and is to perform inclusion to a dc-battery system quickly.
Moreover, although the 6th purpose of this invention is the monitor of a dc-battery, it is at **** and coincidence to prevent contention of a battery test in this case.
Moreover, the 7th purpose of this invention is in cutting control of a power source, and is to enable it to analyze the factor of powering off easily.
And the 8th purpose of this invention is to enable it to prevent a failure of a R/L switch to switch certainly at the time of termination of the maintenance service of a magnetic disk drive and its power unit.
As the subsystem of a medium size computer system with which this invention does not have a power source for backup in self using a computer system, especially a source power supply in order to attain the above-mentioned purpose It is the magnetic disk drive to be used. With two or more directors Two or more disk storage modules accessed in common from these two or more directors, Two or more dc-batteries for directors which supply power to these two or more directors separately, respectively, The dc-battery for disk storage modules which supplies power to said disk storage module, It is characterized by having the power controller which carries out independently supply control of the electric power supply from two or more of said dc-batteries for directors and dc-batteries for disk storage modules according to said two or more directors and the operating state of a disk storage module.
Moreover, this invention is a subsystem of a computer system, especially the medium size computer

system which does not have a power source for backup in self using a source power supply. In the magnetic disk drive which has the structure which contained two or more disk storage modules constituted as a unit which is the magnetic disk drive to be used and became independent respectively, and two or more power supply units which output predetermined direct current voltage to this disk storage module in the housing It is characterized by connecting with a single mother board so that said two or more power supply units may be used as a common power source.
As an example, it is characterized by connecting the dc-battery unit for backup to said mother board in addition to said power supply unit.
It is characterized by having connected said power supply unit to one field of said mother board, and connecting the dc-battery unit for backup to the field of the opposite side as an example.
As an example, said dc-battery unit is characterized by outputting the same direct current voltage as said power supply unit.
As an example, said power supply unit is characterized by making plug-in connection at said mother board.
As an example, said dc-battery unit is characterized by making plug-in connection at said mother board.
It is characterized by having prepared as an example two or more said mother boards which connected said two or more power supply units, having made common connection of power-source Rhine between these two or more mother boards, and considering as a common power source.
As an example, said disk storage module is characterized by building in the DC-DC converter which changes and carries out current supply of the direct-current input voltage from said power supply unit to predetermined direct-current output voltage.
As an example, it is characterized by mounting said disk storage module, a power supply unit, and a mother board in one housing with the disk storage control of said disk storage module.
As an example, said disk storage module and disk storage control are characterized by having the DC-DC converter which outputs the direct current voltage of a proper in response to the same direct-current input voltage.
Moreover, this invention is the disk storage module connected to the subordinate of a magnetic-disk control means, The power supply unit which predetermined direct current voltage changes the input voltage from an external power, and is supplied to said disk storage module, The dc-battery unit which supplies the direct current voltage same at the time of interruption of service as said power supply unit to said disk storage module, In the magnetic disk drive equipped with a power control means to control cutting with powering on of said power supply unit and a disk storage module A completion detection means of charge to be established in said dc-battery unit, to judge the completion of charge of the dc-battery built in when the charging current became below a predetermined value, and to output the notice signal of the completion of charge to said power control means, It is prepared in said power control means, and has a completion nullification means of charge to cancel the completion detecting signal of charge outputted from said completion detection means of charge, at the time of interruption-of-service detection. By the fall of the charging current by the interruption of service generated before the completion of charge When said notice signal of the completion of charge is outputted, to interruption-of-service detection timing, it is characterized by enabling it to judge with charge un-completing.
It is the fall of the charging current by the interruption of service which predetermined made carry out time delay of the notice signal of the completion of charge from said completion detection means of charge, was further equipped with a delay means to supply said power control means, as an example, and was generated before the completion of charge, When said notice signal of the completion of charge is outputted, it is characterized by receiving said notice signal of the completion of charge by delay by said delay means after the interruption-of-service detection timing of said power control means, and enabling it to judge with charge un-completing to interruption-of-service detection timing.
As an example, be prepared in said power control means, read and hold the existence of said notice signal of the completion of charge for every fixed period, and read the completion detecting signal of charge detected in front of predetermined time amount at the time of interruption-of-service detection. It has further a completion judging means of charge to judge the existence of this completion of charge,

and when said notice signal of the completion of charge is outputted by the fall of the charging current by the interruption of service generated before the completion of charge, at interruption-of-service detection timing, it carries out [having enabled it to judge charge un-completing and] as the description.
As an example, when the completion of charge is judged to interruption-of-service detection timing, said power control means directs separation of a disk storage module to said magnetic-disk control means, when it goes through fixed backup time amount (T1), and when the response of cutting authorization is received from said magnetic-disk control means, it is characterized by suspending the current supply by said power supply unit.
As an example, said power control means is characterized by suspending the current supply by said power supply unit, when it judges charge un-completing to interruption-of-service detection timing, and separation of a disk storage module is immediately directed to said magnetic-disk control means, without waiting for progress of fixed backup time amount (T1) and the response of cutting authorization is received from said magnetic-disk control means.
As an example, after answering cutting authorization from said magnetic-disk control means, even if said power control means goes through predetermined time (T2), when a disconnect request is not received, it is characterized by suspending the current supply by said power supply unit, without receiving the response of cutting authorization.
Moreover, this invention is a power supply section having the dc-battery unit which is charged with the direct current voltage of the power supply unit which inputs AC power supply and is changed into direct current voltage, and this power supply unit, and outputs the direct current voltage same at the time of interruption of service, The disk storage module which operates in response to the current supply from this power supply section, The magnetic-disk control section which controls said disk storage module in response to the current supply from said power supply section, In the magnetic disk drive equipped with the power control section which controls cutting from said power supply section with powering on to said disk storage module and a magnetic-disk control section An interruption-of-service detection means to detect an input halt of said AC power supply to said power control circles, Start at the time of the interruption-of-service detection in this interruption-of-service detection means, and the stop time of a power-source input is supervised. The 1st timer which produces a timer output when predetermined backup time amount (T1) is reached When the disconnect indication of a power source is received from high order equipment before the timer output of this 1st timer When powering-off processing of said disk storage module and a magnetic-disk control section is performed based on this disconnect indication and directions of powering off are not received from said high order equipment When said 1st timer output is obtained, it is characterized by establishing the backup control means which performs powering-off processing of said disk storage module and a magnetic-disk control section.
As an example, said backup control means is characterized by disconnecting the power source of said disk storage module and a magnetic-disk control section, when a powering-off control signal is outputted to said disk storage control, the input/output operation of said magnetic-disk section is terminated as powering-off processing of said disk storage module and a magnetic-disk control section and the notice signal of cutting authorization based on termination of input/output operation is received from said magnetic-disk control section.
As an example, it starts at the same time it outputs a powering-off control signal to said power control section from said backup control section at said magnetic-disk control section. The 2nd timer which produces a timer output when the predetermined time (T2) which supervises termination of the input/output operation of said disk storage module is reached is formed. Said backup control means When the notice of authorization of powering off is received from said disk storage control before the timer output of said 2nd timer, based on this notice of authorization, the power source of said disk storage module and a magnetic-disk control section is disconnected. When the notice of authorization of powering off is not received from said disk storage control and the timer output of said 2nd timer is obtained, it is characterized by disconnecting the power source of said disk storage module and a magnetic-disk control section.

As an example, when restoration of a power-source input is detected after interruption-of-service detection, by clearing said 1st timer, said backup control means suspends backup actuation, and is characterized by continuing equipment actuation.
As an example, when restoration of a power-source input is detected after starting of said 2nd timer, while said backup control means clears said 2nd timer, it forbids the cutting actuation based on the notice of authorization of powering off from said magnetic-disk control section, and is characterized by continuing equipment actuation.
Moreover, this invention is the starting approach of the magnetic disk drive which switches on and starts the power source of two or more disk storage modules, and is characterized by dividing said two or more disk storage modules into two or more groups of the same number, changing a time interval for every group, and starting in order.
It is characterized by only for the time amount (deltaT) to which the rush current immediately after starting flows at least shifting each group as an example, and carrying out sequential starting.
As an example, only the time amount (deltaT) to which the rush current immediately after starting flows shifts two groups to the beginning, sequential starting is carried out, and it is characterized by repeating successively so that starting of the group who follows after the completion of starting of the group who started to the 2nd may not be overlapped.
As an example, only the time amount (deltaT) to which the rush current immediately after starting flows shifts two groups, sequential starting is carried out, and it is characterized by repeating the processing which carries out sequential starting of the following two groups similarly after the completion of starting of the group who started to the 2nd.
Moreover, this invention is the starting approach of the magnetic disk drive which switches on and starts the power source of two or more disk storage modules, and is characterized by dividing two or more disk storage modules into two or more groups of the number which is mutually different, shifting a fixed time interval for every group in order of a group with much number, and starting in order.
It is characterized by shifting each group one by one and starting him by abbreviation one half of warm-up time, as an example.
Moreover, this invention is the starting approach of the magnetic disk drive which switches on and starts the power source of two or more disk storage modules, and is characterized by changing the time interval which divides two or more disk storage modules into two or more groups of the number which is mutually different, and starts them for every group, and starting it in order.
It is characterized by only for the time amount (deltaT) to which the rush current immediately after starting flows at least shifting each group as an example, and carrying out sequential starting.
As an example, only the time amount (deltaT) to which the rush current immediately after starting flows shifts two groups, sequential starting is carried out, and it is characterized by repeating the processing which carries out sequential starting of the following two groups similarly after the completion of starting of the group who started to the 2nd.
Moreover, this invention is set to the power supply unit which has each two or more power supply units and the dc-battery unit which accompanies this power supply unit, and is common in an other system, and the magnetic disk drive which has a dc-battery, It is characterized by having the patrol control means which gives the signal under dc-battery monitor actuation between the power control of one system, and the power control of the system of another side, and gives priority to a dc-battery monitor, and supervising the function of the dc-battery which accompanies said common power source, and facing including in a magnetic disk drive, and controlling the coincidence monitor of a dc-battery, and the inclusion timing to the magnetic disk drive of a dc-battery.
As an example, timely, said power control supervises the ready state of a dc-battery, shortly after it detects that it is in the ready state which can back up a dc-battery, it starts monitor actuation of an applicable dc-battery, and if the dc-battery function is appropriate, it will be characterized by performing inclusion to the system of the dc-battery concerned.
the near power control with which said power control sends out as an example the master signal which shows that when self-equipment supervises to said patrol control means, and this patrol control means

has not received said master signal -- receiving -- other systems -- a dc-battery monitor -- it is characterized by sending out the other-system patrol signal which shows a working thing.
Moreover, it sets to the power supply unit which has a power supply unit and the dc-battery unit which accompanies this power supply unit to two or more each in this invention, and is common in an other system, and the magnetic disk drive which has a dc-battery. It has the cross control means which carries out cross control of the connection with the power source and dc-battery common to between the power control of one system, and the power control of the system of another side. And it has an address selection means to set up the address which shows self equipment in each power control. While it was chosen switches said cross control means based on the address of a system. Therefore, it is characterized by considering as the configuration which communalized the common power supply unit and the accompanying dc-battery to the both system.
As an example, it is characterized by performing a battery test and a monitor only from one system by the address selection of the own system by said address selection means.
Moreover, in this invention, have a power supply section and a function part at least, and it sets to the disk storage control which performs cutting control of a power source. The power supply unit which carries out current supply to each DORAIMU module in said power supply section, It has the dc-battery unit which backs up a power source at the time of interruption of service. On the other hand Besides the 1st storage means which records the hysteresis at the time of failure generating etc. on said function part It has 2nd storage means to take the log of a power-source operating condition. The backup signal which shows the purport which used the dc-battery for backup by interruption of service when the power source of a system disconnects said power supply section, The automatic-disconnect signal which shows the purport that progress of the maximum charging time value cut the power source automatically after switching to a dc-battery It sends out to said function part. Next, if a powering-off demand signal is sent out from said power supply section to said function part and said function part receives said powering-off demand signal after the predetermined processing including preparation of powering off, and said power supply section -- a powering-off signal -- sending out -- and said function part -- this -- the 2nd storage means carries out the log of said backup signal and said automatic-disconnect signal, when said powering-off demand signal is received, and refer to said 2nd storage means for it. Therefore, it is characterized by judging power-source operating conditions, such as the last powering off, to the following power up.
As an example, when notifying the purport which carried out powering off automatically after progress of the maximum charging time value of a dc-battery, said automatic-disconnect signal is characterized by setting it as a low level high-level, when powering off is compulsorily carried out before progress of the maximum charging time value.
As an example, said 2nd storage means is characterized by using a part of memory area of said 1st storage means.
As an example, it is characterized by said 1st and 2nd storage means using a hard disk.
Moreover, in the magnetic disk drive which displays a power-source condition, on the power-source maintenance panel of this magnetic disk drive, this invention should be manually operated at the time of a maintenance service, or should mind a power control interface from high order equipment. The power-source ON / off switch which performs powering on and cutting The side in which remoteness to powering on and cutting are possible (REMOTE), The R/L switch which switches the side (LOCAL) in which powering on and cutting are possible according to an individual, It has a display means to display the condition of this R/L switch. At the time of the maintenance service of said magnetic disk drive After making said R/L switch into the "LOCAL" side, it is characterized by for said power-source ON / off switch performing powering off, and making said R/L switch into the "REMOTE" side after termination of a maintenance service, and displaying said display means.
Easy explanation of a drawing Drawing 1 is example mounting structural drawing of the magnetic disk drive by this invention.
Drawing 2 is structural drawing of the rear face of the mounting structure of drawing 1.
Drawing 3 is the block diagram showing the system configuration of drawing 1.

Drawing 4 is the circuit block diagram showing the power control network of drawing 1.
Drawing 5 is the circuit block diagram showing the electrical power supply system of drawing 1.
Drawing 6 is the explanatory view which took out drawing 1 and the mounting structure of drawing 2 from the inside of a locker, and was developed.
Drawing 7 is example mounting structural drawing of the conventional magnetic disk drive.
Drawing 8 is the principle block diagram of the backup at the time of interruption of service by this invention.
Drawing 9 is the one example circuit block diagram showing the electrical power supply system of drawing 8.
Drawing 10 is the one example circuit block diagram of the dc-battery unit of drawing 8.
Drawing 11 is a timing chart which shows the judgment timing of the notice signal of the completion of charge at the time of the interruption of service in drawing 9.
Drawing 12 is a flow chart which shows the power control processing in drawing 9.
Drawing 13 is the flow chart which made the subroutine interruption-of-service monitor processing in drawing 9.
Drawing 14 is other example circuit block diagrams showing the electrical power supply system of drawing 8.
Drawing 15 is a timing chart which shows the judgment timing of the notice signal of the completion of charge at the time of the interruption of service in drawing 14.
Drawing 16 is the flow chart which made the subroutine interruption-of-service monitor processing in drawing 14.
Drawing 17 is an example block diagram of a magnetic disk drive with a dc-battery unit built-in [conventional].
Drawing 18 is the timing chart of the notice signal of the completion of charge accidentally generated at the time of the conventional interruption of service.
Drawing 19 is the principle block diagram of the backup control by this invention.
Drawing 20 is an example circuit block diagram showing the electrical power supply system in drawing 19.
Drawing 21 is a flow chart which shows the backup control in drawing 19.
Drawing 22 is the important section block diagram of the conventional magnetic disk subsystem.
Drawing 23 is the important section block diagram of the conventional backup control.
Drawing 24 is the principle explanatory view of starting control of the magnetic disk drive by this invention.
Drawing 25 is the one example timing chart of the starting control by drawing 24.
Drawing 26 is other example example timing charts of starting control of drawing 24.
Drawing 27 is the example example timing chart of further others of the starting control by drawing 24.
Drawing 28 is the example example timing chart of further others of the starting approach by drawing 24.
Drawing 29 is the flow chart of starting control of drawing 24.
Drawing 30 is the warm-up time per disk storage module, and the explanatory view of current change.
Drawing 31 is an example timing chart of the conventional starting control.
Drawing 32 is other example timing charts of the conventional starting control.
Drawing 33 is the principle block diagram of the power-source monitor by this invention.
Drawing 34 is the timing chart of the dc-battery patrol in drawing 33.
Drawing 35 is an inclusion timing chart to the dc-battery monitor and system in drawing 33.
Drawing 36 is the timing chart of the dc-battery patrol at the time of the contention in drawing 33.
Drawing 37 is a procedure flow chart (the 1) in drawing 33.
Drawing 38 is a procedure flow chart (the 2) in drawing 33.
Drawing 39 is a procedure flow chart (the 3) in drawing 33.
Drawing 40 is the important section block diagram of the power supply section of a magnetic disk drive.

Drawing 41 is the conventional dc-battery monitor and an inclusion timing chart to a system.
Drawing 42 is the principle block diagram of the power-source change-over control by this invention.
Drawing 43 is the one example circuit diagram of the cross control circuit of the drawing 42 configuration.
Drawing 44 is the initiation flow chart of the battery test in drawing 42.
Drawing 45 is the block-diagram of the conventional power-source change-over control.
Drawing 46 is the principle block diagram of the analysis of the powering-off factor by this invention.
Drawing 47 is the processing flow chart of powering off in drawing 46.
Drawing 48 is the principle block diagram of the analysis of the conventional powering-off factor.
Drawing 49 is the processing flow chart of powering off in drawing 48.
Drawing 50 is the important section block diagram of the power-source maintenance display panel by this invention.
Drawing 51 is the processing flow chart of the maintenance service in drawing 50.
Drawing 52 is the important section block diagram of disk storage control.
Drawing 53 is the important section block diagram of the power-source circumference in drawing 52.
Drawing 54 is the important section block diagram of the conventional power-source maintenance display panel.
Drawing 55 is the processing flow chart of the maintenance service in drawing 54.
Drawing 56 is the appearance perspective view of the magnetic disk drive which applied this invention.
The best gestalt for inventing The structure of the magnetic disk drive by this invention is explained first. The conventional structure and its trouble are explained along with a drawing before explanation of this invention.
Drawing 7 is example structural drawing of the conventional magnetic disk drive. This Fig. shows locker mounting structure in the state of fluoroscopy. Among drawing, 100 are the locker of a magnetic disk drive and are carrying out plug-in of 16 sets of the disk storage modules 102 on the circuit board 106 into the locker 100. The disk storage module 102 contained AC-DC converter 104, received supply of a commercial of AC100V from NFB108 for modules, and has generated DC**5V and DC**12V.
[required for the drive of a disk storage module 102]
To failure generating since [a disk storage module 102] it is exchangeable, it is equipped with it to the circuit board 106 by the plug-in system which can be detached and attached freely. However, current supply to built-in AC-DC converter 104 is performed by cable splicing.
On the other hand, the disk storage control which controls 16 sets of disk storage modules puts a disk storage module 102 on a subordinate per eight sets, therefore is contained by the locker with two special sets of disk storage control (not shown). However, two sets of AC-DC converters 112 which supply the power source to the disk storage control of this special locker are prepared in the locker 100 like illustration, they receive supply of AC100V from NFB114 for control, make regular DC electrical potential difference, and supply it to disk storage control using a power cable. In addition, 116 is an interface receipt box which connects 16 sets of disk storage modules 102 to the disk storage control of a locker separately.
On the other hand, there are a miniaturization of a disk storage module and increase of the number mounted in the locker accompanying it as a demand of a commercial scene, and the so-called demand of densification is strong.
As a result of mounting disk storage control separately contained in the locker as mentioned above in the same locker as a disk storage module as such a factor that checks densification and coming to attain a miniaturization more, the amount of the cable used which supplies a power source to a disk storage module and disk storage control from a power supply unit increases, and it has become the factor which bars high density assembly.
Moreover, although the power source of a large-scale computer system did not use the usual source power supply but the power-source facility of dedication is generally formed as mentioned above, it has the dc-battery unit and emergency generator for backup in this power-source facility, and the dc-battery for backup is not formed in the large-scale computer system itself. And although the magnetic disk drive

of a locker receipt mold is used as a subsystem of a large-scale computer system, it has received current supply from this external power facility in common. Therefore, the power source for backup will be prepared outside.
However, the medium size computer system used in office etc. does not form the external power facility like a large-scale computer system, but is operated by the usual source power supply. Therefore, backup by external power facility cannot be performed. Also in such a medium size computer system, the magnetic disk drive of a locker receipt mold is similarly used as a subsystem with it being large-sized, therefore it is necessary to mount the power source for backup in the locker of a magnetic disk drive on the other hand in recent years.
Therefore, it is increase of the amount of the power cable used by receipt of the dc-battery unit into a locker, and has become the factor which checks densification further.
It is necessary to make disk storage control build in in the magnetic disk drive of the locker mold used as a subsystem of a medium size computer system in short, and to make the dc-battery for backup build in. Therefore, the amount of the power cable used will increase and, originally it has become the factor which checks the densification by increase of the number accompanying the miniaturization of a disk storage module.
Drawing 1 is example structural drawing of the magnetic disk drive by this invention. This Fig. shows a locker mold magnetic disk drive in the state of fluoroscopy. Like illustration, the magnetic disk drive of this invention has contained two or more disk storage modules 148-1 to 148-8, two or more power supply units (AC/DC converter) 112-1 to 112-4 which change alternating current input voltage into predetermined direct current voltage, and are supplied at each disk storage module 148, and disk storage control 152 in a locker 150. Two power supply units 112-1 and 112-2 are connected to the mother board 160-1 for power sources, and plug-in of two power supply units 112-3 and 112-4 is carried out to the mother board 160-2 for power sources. Furthermore, the dc-battery unit 114-1 to 114-12 for backup is connected to the mother board 160-1 to 160-2. The power supply unit 112-1 to 112-4 was connected to one field of this dc-battery and a mother board 160-1,160-2, and the dc-battery unit 114-1 to 114-12 for backup is connected to the field of the opposite side. The power supply unit 112 and the dc-battery unit 114 are connected to the mother board 160 by the plug-in system which can be detached and attached freely.
When two or more mother boards 160-1,160-2 are formed, common connection of power-source Rhine between these is made, and it considers as a common power source.
Furthermore, DC-DC converter 116-1 to 116-4 which changes and carries out current supply of the direct-current input voltage from a power supply unit 112-1 to 112-4 to predetermined direct-current output voltage is formed in the disk storage module 148-1 to 148-8.
These disk storage modules 148, a power supply unit 112, a mother board 160, and disk storage control 152 are mounted in one locker.
In this case, a disk storage module 148 and disk storage control 152 are equipped with DC-DC converter 116 which outputs the direct current voltage of a proper in response to the same direct-current input voltage.
In such a configuration, by connecting two or more power supply units 112 by the mother board 160, a power supply unit 112 can be share-ized and doubleness of a power source is attained. Moreover, the backup at the time of the failure of a power source and interruption of service is attained by connecting the dc-battery unit 114 to a mother board 160.
Furthermore, by outputting the same DC power supply as the dc-battery unit 114, a power supply unit 112 becomes usable [the same current supply line], and becomes reducible [a cable number]. By supplying a low-pressure DC power supply to coincidence compared with supplying a high-pressure AC power, withstand voltage can adopt a low cable and becomes reducible [cable tooth spaces].
Furthermore, exchange and extension of a unit can be easily performed by making plug-in connection of the power supply unit 112. By making plug-in connection of the dc-battery unit 114 similarly, exchange and extension of a unit can be performed easily.
On the other hand, when it has two or more power supply units 112 connected to the mother board 160,

by connecting between mother boards 160, share-izing of a power source is possible and extension of the power source corresponding to a miniaturization and drive extension of a mother board 160 is attained. Moreover, by sharing many power supply units, the power supply per power supply unit can be lessened, and a miniaturization becomes possible.
Furthermore, by building in DC-DC converter 116 which supplies the same input voltage as disk storage control 152 and a disk storage module 148, the power-source line from a power supply unit 112 can be managed with one circuit, and becomes improvable [reduction of cable tooth spaces, and a cable splicing activity].
In drawing 1, in the locker 150 which constitutes the housing of a magnetic disk drive, eight sets of disk storage modules 148-1 to 148-8 are mounted by this example, and four sets are arranged in each two trains like illustration. Moreover, disk storage control 152 is mounted in the mother board 154 for control. In disk storage control 152, common cache memory is stored with two sets of directors so that it may mention later. DC-DC converter 116-1 to 116-4 is mounted in the field of the opposite side of the mother board 154 for control. The control panel 124-1 to 124-2 corresponding to two power control systems is formed in the both sides of this DC-DC converter 116.
Moreover, on the mother board 160-1 for power sources, two AC/DC converters 112-1 to 112-2 are mounted, and two AC/DC converters 112-3 to 112-4 are mounted also on the mother board 160-2 for power sources. Five sets of the dc-battery unit 114-1,114-5 to 114-8 are mounted in the field of the opposite side of the mother board 160-1 for power sources, and five sets of the dc-battery unit 114-3,114-7 to 114-12 are mounted in the field of the opposite side of the mother board 160-2 for power sources.
The breaker receipt box 134, the interface receipt box 156, and the AC-power-supply drawing-in box 158 are installed in the pars basilaris ossis occipitalis in a locker 150.
Drawing 2 is the explanatory view having shown the mounting structure in the locker 50 of drawing 1 in the state of fluoroscopy similarly from the rear-face side.
If shown in drawing 2, the condition that a disk storage module 148-1 to 148-4 and four 148-5 to 148-8 are mounted at a time to the mother board 162-1,162-2 for a drive of two sheets installed in the rear-face side is known. Moreover, the rear-face side of the mother board 160-1,160-2 for power sources understands the condition that the dc-battery unit 114-1,114-5 to 114-8 and five dc-battery units 114-9 to 114-12 are mounted at a time.
Each of AC-DC converter 112-1 to 112-4 to the mother board 160-1,160-2 for power sources shown in drawing 1 and drawing 2 and the dc-battery unit 114-1 to 114-12 is prepared free [attachment and detachment] according to plug-in structure.
Drawing 3 is the circuit block diagram having shown the subsystem of the computer system which used the magnetic disk drive of this invention.
In drawing 3, 136 is a channel processor and has four channels 138-1 to 138-4.
In the locker 150 of a magnetic disk drive, the director 118-1,118-2 who functions as disk storage control was formed, and it has connected from the BMC port 142-1 to 142-4 through the BMC interface (block multiplexer channel interface) 140 to a channel 138-1 to 138-4.
To a director 118-1,118-2, the string controller 144-1,144-2 is formed, and the device interface 146 is drawing out every two-line a total of four pass from the string controller 144-1,144-2.
If it is in this example, cross connection is made from the string controller 144-1,144-2 at pass by making eight sets of disk storage modules 148-1 to 148-8, and 148-9 to 148-16 into one group.
In addition, if it is in the example of drawing 1, eight sets of a disk storage module 148-1 to 148-8 are mounted, and it is mounted in another locker as an extended part about the remaining disk storage modules 148-9 to 148-16.
Moreover, a channel processor 136 is connected as a subsystem to the channel of the main storage controller of the computer system equipped with CPU, a main storage controller (MSC), and main storage (MSU).
Drawing 4 is the circuit block diagram having shown drawing 1 and the power control network which can be put on the example of drawing 2.

In drawing 4, the 1st power control section 180-1 and the 2nd power control section 180-2 are formed in the disk storage control 152 of drawing 1. Moreover, corresponding to four sets of a disk storage module 148-1 to 148-4, the 1st drive section 182-1 is formed, and the 2nd drive section 182-2 is formed corresponding to a disk storage module 148-5 to 148-8.
The power controller 110-1 is formed in the 1st power control section 180-1, and powering on to each part and cutoff control are performed. To the power controller 110-1, an external service processor (SVP) etc. is connected from a terminal 128-1 through the high order interface 122-1, and powering-on control of the whole equipment is started in response to a powering-on command from a service processor.
Moreover, the maintenance panel 124-1 was formed in the power controller 110-1, and 7 segment drop which shows the switch for switching on and disconnecting the power supply unit placed by the subordinate of the power controller 110-1 by the manual and the alarm condition of each power supply unit is formed.
The control line from the power controller 110-1 is given to the director 118-1, DC-DC converter 116-1,116-2, AC-DC converter 112-1, and the dc-battery unit 114-1,114-2 according to the individual.
Moreover, the control line from the power controller 110-1 to dc-battery unit 114-1,114- is performed through the interface controller 126-1.
The configuration is the same also about the 2nd power control section 180-2 side.
To the dc-battery unit 114-5 to 114-8 and DC-DC converter 116-5 to 116-8 which were formed in the 1st drive section 182-1, two control lines are given from the power controller 110-1,110-2.
Moreover, two control lines are similarly given from the power controller 110-1,110-2 to the dc-battery unit 114-9 to 114-12 and DC-DC converter 116-9 to 116-12 of the 2nd drive section 182-2.
Two control lines are given from the power controller 110-1,110-2 also about AC-DC converter 112-3,112-4 furthermore prepared in the 2nd drive section 182-2.
The power controller 110-1 makes the controlled system AC-DC converter 112-3 prepared in each unit and the 2nd drive section 182-1 which have been prepared in the 1st drive section 182-1, and the power controller 110-2 makes the controlled system other units except AC-DC converter 112-3 prepared in the 2nd drive section 182-2 here.
Thus, although the controlled system of the power controller 110-1,110-2 was decided beforehand, when a failure occurs by either, it is doubled so that a normal side may put all power supply units on a subordinate and can perform control of powering on or cutting.
In addition, if it is in the common cache memory 120, it is excepted from the object of the power control by the power controller 110-1,110-2.
Drawing 5 is the circuit block diagram having taken out and shown the electrical power supply system in the example of drawing 1.
An electrical power supply system is divided into the power control unit 152 and the 1st and 2nd drive section 182-1,182-2 in drawing 5.
The electrical power supply system in the power control unit 152 is symmetrically prepared to the common cache memory 120. For example, if the common cache memory 120 bottom is seen, the ac input from the AC input terminal 130-1 will be inputted into AC-DC converter 112-1 through a noise filter 132-1 and a breaker 134-1, for example, DC29V will be outputted.
AC-DC converter 112-1 supplies a power source to the power controller 110-1, and is always taken as operating state. Moreover, DC29V output of AC-DC converter 112-1 is changed into DC**5V and **12V by DC-DC converter 116-1, and is supplied to the director 118-1. Moreover, similarly it is changed into DC**5V and DC**12V with DC-DC converter 116-1, and the power source is supplied to the common cache memory 120.
The ac input from the AC input terminal 130-2 is similarly changed into DC29V by AC-DC converter 112-2 through a noise filter 132-2 and a breaker 134-2 about the common cache memory 120 bottom, it changes into DC electrical potential difference predetermined by the DC converter 116-3,116-2, and the power source is supplied to a director 118-2 and the common cache memory 120.
Moreover, the power controller 110-2 is received and direct current voltage is supplied from AC-DC

converter 112-2.
The dc-battery unit 114-1,114-2 and 114-3,114-4 are connected to power-source Rhine of AC-DC converter 112-1,112-2. AC input makes the built-in cell the charge condition in response to the supply of DC29V from AC-DC converter 112-1,112-2 in the normal condition, and if AC input is severed by interruption of service or hits, the dc-battery unit 114-1 to 114-4 will supply the DC29V [same] as AC-DC converter 112-1,112-2 to DC-DC converter 116-1 to 116-3, and will back up a director 118-1,118-2 and the common cache memory 120.
Supply of DC29V is received in common from two sets of AC-DC converters 112-1,112-2 which DC-DC converter 116-5 to 116-8 was formed in the drive section 182-1, and have been prepared in the power control unit 152 on the other hand, and DC**5V and DC**12V are supplied to corresponding each of disk enclosure 136-1 to 136-4.
Here, DC-DC converter 116-5 to 116-5 and disk enclosure 136-1 to 136-4 are built in each of the disk storage module 148-1 to 148-4 shown in drawing 3.
Moreover, the dc-battery unit 114-5 to 114-8 is formed in the 1st drive section 182-1, and common connection is made from AC-DC converter 112-1,112-2 in power-source Rhine, and DC24V are supplied at the time of interruption of service or hits of AC input, and it enables it to back up a converter 116-5 to 116-8.
The 2nd drive section 182-2 supplies AC input from the AC input terminal 130-3 to AC-DC converter 112-3,112-4 through a noise filter 132-3 through the breaker 134-3,134-4 divided into two more lines. AC-DC converter 112-3,112-4 changes AC100V input into DC29V, and supplies it to DC-DC converter 116-9 to 116-12 as a common power source.
DC-DC converter 116-9 to 116-12 supplies DC**5V and DC**12V to disk enclosure 136-5 to 136-8. Moreover, common connection of the dc-battery unit 112-9 to 112-12 is made in output Rhine of AC-DC converter 112-3,112-4, and it enables it to back up at the time of interruption of service or hits.
In addition, if it is in drawing 1 and the mounting structure of drawing 2, the dc-battery unit 114-2,114-4 prepared in the power control unit 152 of drawing 5 has taken for the example the case where did not equip but it equips with remaining ten sets of dc-battery units.
Drawing 6 is the explanatory view having taken out, developed and shown the mounting structure shown in drawing 1 and drawing 2. The development view of this drawing 6 supports the circuit block diagram of an electrical power supply system shown in drawing 5, and the cable splicing condition between the connection condition of each unit to a mother board, a mother board, and a unit becomes clear.
In drawing 6, plug-in of AC-DC converter 112-1,112-3 and each of 112-2,112-4 is carried out to the mother board 160-1,160-2 for power sources. This plug-in is realized by inserting the connector 66 prepared in the unit side to the connector 164 by the side of a board.
Plug-in of the dc-battery unit 114-1,114-5 to 114-8 and 114-3,114-9 to 114-12 is carried out to the field of the opposite side of the mother board 160-1,160-2 for power sources with the plug-in structure by the connector 164,166.
Moreover, to the mother board 162-1,162-2 for a drive, plug-in of a disk storage module 148-1 to 148-4 and each of 148-5 to 148-8 is carried out. Moreover, DC-DC converter 116-5 to 116-12 is built in the disk storage module 148-1 to 148-8.
Furthermore, plug-in of four sets of DC-DC converters 116-1 to 116-4 is carried out to the mother board 54 for control.
Between the mother board 160-1 for power sources, and 160-2, as connection by the power cable 170-1,170-2 showed to the power-source schematic diagram of drawing 5, common use-ization of a power source is performed. Moreover, a power cable 172-1 connects between a mother board 160-1 and the mother board 162-1 for a drive, and it connects with a power cable 172-2 between the mother board 160-2 for power sources, and the mother board 162-2 for a drive, and similarly, as this part was also shown in the power-source schematic diagram of drawing 5, common use-ization of a power source is performed.
Furthermore, to DC-DC converter 116-1,116-2 formed in the mother board 154 for control, and 116-

3,116-4, current supply is performed according to the individual by the power cable 170-3,170-4 from the mother board 160-1,160-2 for power sources.
As explained above, according to the structure of the magnetic disk drive by this invention,-izing of two or more power supply units can be carried out [****], without needing a power cable by connecting two or more power supply units to a mother board, the amount of the power cable used can be reduced, and high density assembly of equipment can be realized.
Moreover, since backup at the time of a power failure or interruption of service can be realized by mounting a dc-battery unit and cable splicing is not needed for the rear-face side of the mother board which mounted the power supply unit about a dc-battery unit, either, high density assembly is realizable.

Moreover, a required power supply can be appropriately set up to extension of a disk storage module by what the power supply unit and the dc-battery unit are made into the plug-in structure which can be detached and attached freely for to the mother board.
Moreover, direct current voltage supplied from the power supply unit prepared in the mother board side can be made into the same electrical potential difference by forming a DC-DC converter in disk storage control and a disk storage module, and performing conversion to direct current voltage required for each, and since what is necessary is just to go across one power cable for this reason, and to connect, the amount of the power cable used can be reduced further.
Next, the backup from the dc-battery unit at the time of interruption of service by this invention is explained below. The conventional method and its trouble are explained before explanation of this invention.
Drawing 17 is the important section block diagram of the magnetic disk drive which contained the dc-battery unit.
In drawing 17, 212 is an AC-DC converter which functions as a power supply unit, inputs AC100V, for example, changes them into DC29V. The power source from AC-DC converter 212 is supplied to the disk storage module connected to the subordinate of the director 218 who functions as disk storage control, and a director 218.
In addition, the director 218 and the disk storage module 248 contain DC-DC converter 216, and are generating DC electrical potential difference required for each. Moreover, although two or more disk storage modules 248 are installed, only one set is shown in order to simplify explanation.
The dc-battery unit 214 is connected to power-source Rhine from AC-DC converter 212. When the charging current comes below a predetermined value in the dc-battery unit 214, the circuit which detects the completion of charge and outputs the notice signal of the completion of charge is prepared.
The dc-battery unit 214 can guarantee current supply [the guaranteed backup time amount T1 which is decided by power resource], if charge by DC29V from AC-DC converter 212 is received and interruption of service occurs in the state of the completion of charge.
The power controller 210 controls injection of a power source, and cutting in response to the directions from high order equipment. Moreover, when interruption of service is detected, after ending the I/O process of a disk storage module 248 by the director 218 in the backup time amount T1 guaranteed by the dc-battery unit 214, actuation of AC-DC converter 212 and DC-DC converter 216 is suspended, and a power source is disconnected.
However, in spite of sending out the notice signal of the completion of charge which was mistaken with interruption of service and not guaranteeing power-source backup time amount if it is in the magnetic disk drive equipped with such a power-source backup function, and interruption of service occurs in the condition before the completion of charge of a dc-battery unit, the problem performed in the same backup process as the time of the completion of charge is.
Drawing 18 is the explanatory view of the conventional trouble. It is as follows when it explains concretely with reference to drawing 18. Supposing interruption of service occurs [the completion signal of charge which charge of the dc-battery unit 214 has not completed now] at the time of day t0 of L level, supply voltage Vcc will begin a fall gradually. The completion of charge of the dc-battery unit 212 is detected because the charging current became below the predetermined value, if supply voltage

Vcc falls to Vref1 with interruption of service of time of day t0, the charging current will also fall below to default value, and it will detect it accidentally with the completion of charge at time of day t1, and it makes H level the notice signal of the completion of charge over the power controller 210.
Then, supply voltage Vcc detects interruption of service because the power controller 210 became two or less reference voltage Vref at time of day t2.
If the power controller 210 detects interruption of service at time of day t2, the notice signal of the completion of charge acquired at this time will be read, and the existence of the completion of charge will be judged. In this case, although it has not charge completed in fact, since the notice signal of the completion of charge is in H level which shows completion, after it is judged with the completion of charge and it makes the usual I/O process continue [the guaranteed power-source backup time amount T1], it directs termination of the I/O process for powering off to a director 218, waits for a response, and cuts a power source.
However, charge is insufficient, the supply voltage from the dc-battery unit 214 was less than a director 218 and the level of a disk storage module 248 of operation in the middle of the power-source backup time amount T1, and the dc-battery unit 214 had the problem which causes abnormal termination and data corruption of a computer system by halt of a subsystem.
This invention aims at the ability to be made to do powering off appropriately, without causing system abnormal termination and data corruption, even if it was made in view of such a conventional trouble and interruption of service occurs before the completion of dc-battery charge.
Drawing 8 is the principle explanatory view of backup by the dc-battery at the time of interruption of service by this invention.
The magnetic disk drive which applies this invention first is with the disk storage module 248 connected to the subordinate of disk storage control (director) 218, It has the power supply unit (AC-DC converter) 212 which changes the input voltage from an external power into predetermined direct current voltage, and is supplied to a disk storage module 248, the dc-battery unit 214 which supplies the direct current voltage same at the time of interruption of service as a power supply unit 212 to a disk module 248, and a power control means (power controller) 210 to control cutting with powering on of a power supply unit 212 and a disk storage module 248.
If it is in this invention about such a magnetic disk drive, a completion detection means 2112 of charge to judge the completion of charge of the cell built in when the charging current became the dc-battery unit 214 below a predetermined value, and to output the notice signal of the completion of charge to the power control means 210 first is established. Moreover, the completion nullification means of charge is formed in the power-control means 210, and the completion detecting signal of charge outputted from the completion detection means 2112 of charge at the time of interruption-of-service detection is cancelled, and when the notice signal of the completion of charge is outputted by the fall of the charging current by the interruption of service generated before the completion of charge, it enables it to judge charge un-completing at interruption-of-service detection timing.
Moreover, the notice signal of the completion of charge from the completion detection means 2112 of charge A delay means (a counter) 286 make carry out predetermined-time delay and supply to a power-control means 210 prepares, and when the notice signal of the completion of charge is outputted by the fall of the charging current by the interruption of service generated before the completion of charge of the dc-battery unit 214, make it make the notice signal of the completion of charge receive by delay by the delay means 286 after the interruption-of-service detection timing of a power-control means 210, and it enables it to judge charge un-completing at interruption-of-service detection timing.
Furthermore, a completion judging means of charge to read and hold the notice signal of the completion of charge for every fixed period, to read the completion detecting signal of charge detected in front of predetermined time instead of the delay means 2112 at the time of interruption-of-service detection, and to judge the existence of the completion of charge may be formed in the power control means 210.
When the notice signal of the completion of charge is outputted also by this completion judging means of charge by the fall of the charging current by the interruption of service before the completion of charge of the dc-battery unit 214, to interruption-of-service detection timing, it can judge with charge

un-completing.
The power control means 210 suspends the current supply by the power supply unit 212 here, when the completion of charge is judged to interruption-of-service detection timing, isolation of a disk storage module 248 is directed to the disk control means 218 and the response of cutting authorization is received from the magnetic-disk control means 218, after it went through fixed backup time amount T1. Moreover, when charge un-completing is judged to interruption-of-service detection timing, isolation of a disk storage module 248 is immediately directed to the disk control means 218, without waiting for progress of fixed backup time amount T1, and when the response of cutting authorization is received from the magnetic-disk control means 218, the current supply by the power supply unit 212 is suspended.
Furthermore, after answering cutting authorization from the magnetic-disk control means 218, even if it goes through predetermined time T2, when a disconnect request is not received, the current supply by the power supply unit 212 is suspended, without obtaining cutting authorization.
According to the magnetic disk drive of this invention equipped with such a configuration, even if interruption of service occurs, the completion of charge mistaken by the fall of the charging current accompanying interruption of service is detected and the notice signal of the completion of charge is outputted before the completion of charge of the dc-battery unit 214, after fixed time delay is carried out by the delay means 286, it is sent to the power control means 210.
For this reason, even if interruption-of-service detection is performed by the power control means 210 after sending out of the notice signal of the completion of charge, the notice signal of the completion of charge still shows charge un-completing at this time, and it can judge charge un-completing [which shows a charge condition actual to interruption-of-service detection timing].
For this reason, isolation of a disk storage module 248 is immediately directed to the magnetic-disk control means 218, without making the usual I/O actuation covering the predetermined backup time amount T1 continue. For this reason, registration of the new I/O demand to a disk storage module 248 is forbidden, after the I/O process under receptionist under current processing is completed, it detaches, and it notifies cutting authorization to the power control means 210.
Based on the response of this cutting authorization, the power control means 210 disconnects the current supply to a disk storage module 248, and suspends a subsystem.
For this reason, even if the completion signal of charge which was mistaken with interruption of service is sent out, it is judged with charge un-completing, an I/O process is ended immediately, a power source is disconnected, and the system abnormal termination and data corruption at the time of interruption of service can be prevented certainly.
Drawing 9 is what took out and showed the electrical power supply system and control network in a magnetic disk drive of this invention shown in drawing 4 and drawing 5 about the power controller 110-1 (210-1) side, and it takes out and shows only AC-DC converter 212-1 (112-1), DC-DC converter 216-5 (116-5), and the dc-battery unit 214-5 (114-5) in order to simplify explanation.
In drawing 9, the microprocessor 260 was formed in the power controller 210-1, and it has the 1st timer 275-1 which measures the backup time amount T1 which guarantees the usual I/O process at the time of a power-source halt, and the 2nd timer 275-2 which supervises the isolation processing time T2 after backup time amount T1 progress by program control.
The interface section [as opposed to RAM264, ROM266, and other power controllers 210-2 in the internal bus 262 from a microprocessor 260] 268, the interface section 270 for directors to a director 218-1, The interface section 272 for panels to a maintenance panel 224-1, the interface section 274 for high orders to the service processor of a high order, the interface section 276 for disks to a disk storage module 248-1, AC-DC converter 212-1, The interface section 278 for converters to DC-DC converter 216-5, and the interface section 284 for dc-batteries to the dc-battery unit 214-5 It has prepared.
To the dc-battery unit 214-5, the charge control signal E1 and the battery test signal E2 are outputted from the interface section 284 for dc-batteries, and the notice signal E3 of the completion of charge and the notice signal E4 of the abnormalities in a dc-battery are outputted from the dc-battery unit 214-5.
The notice signal E3 of the completion of charge from the dc-battery unit 214-5 is inputted into the

counter 286 as a delay means, and it starts counter actuation from an input time, and he is trying to output the notice signal E30 of the completion of charge delayed after fixed time amount defined beforehand to the interface section 284 for dc-batteries here.
Drawing 10 is the circuit diagram having shown one example of the dc-battery unit 214-5 of drawing 9. In drawing 10, it connects with power-source Rhine from AC-DC converter 212-1, and the power supply terminal 288-1,288-2 of positive/negative receives DC29V. DC29V inputted are supplied to a dc-battery 298 through the charging current detector 290, a stabilization circuit 292, diode 294, and a breaker 296, and charge a dc-battery 298.
A stabilization circuit 292 keeps constant the charge electrical potential difference to a dc-battery 298, and he is trying to regulate the rush current at the time of charge initiation. The charging current detector 290 detects the charging current over a dc-battery 298. Specifically, the electrical potential difference corresponding to the charging current is detected by passing the charging current to resistance.
The detecting signal of the charging current detector 290 is given to the completion detector 2112 of charge, when a detection electrical potential difference turns into one or less reference voltage Vref as compared with the reference voltage Vref1 which defined beforehand the detection electrical potential difference corresponding to the charging current (i.e., when the charging current becomes below default value), it produces the completion detection output of charge, and it outputs the notice signal E3 of the completion of charge from an interface circuitry 2110.
The circuit which carried out series connection of the discharge control switch 2100 and the diode 2102 from the dc-battery 298 side is connected to the charging current detector 290, a stabilization circuit 292 and the series circuit of diode 294, and juxtaposition. The discharge control switch 2100 is turned on in response to the discharge control signal E1 over an interface circuitry 2110, and connects the plus side of a dc-battery 298 to external power-source Rhine through diode 2102.
For this reason, if the discharge control switch 2100 has closed, even if DC29V from AC-DC converter 212 are severed by interruption of service, the DC29V [same] which have charged the dc-battery 298 will be supplied outside through a breaker 296, the discharge control switch 2100, and diode 2102.
Furthermore, series connection of a test switch 2104 and the discharge resistance 2106 and 2108 is carried out to juxtaposition with the dc-battery 298. To a test switch 2104, a test signal E2 is given through an interface circuitry 2110, and it is made to perform the discharge test of a sink and a dc-battery 298 for the discharge current to the discharge resistance 2106 and 2108 from the dc-battery 298 by turning on a test switch 2104. In addition, the discharge control switch 2100 is turned OFF in the case of a discharge test.
In a discharge test, if the dc-battery 298 is unusual and the discharge current will be passed to the discharge resistance 2106 and 2108 [fixed time amount], the electrical potential difference of a dc-battery 298 will fall greatly. The electrical potential difference of a dc-battery 298 is inputted into the dc-battery malfunction detection circuit 2114 as a partial pressure electrical potential difference of the discharge resistance 2106 and 2108. The dc-battery malfunction detection circuit 2114 detects the abnormalities in a dc-battery, when a detection electrical potential difference becomes below a fixed electrical potential difference on the occasion of a discharge test, and it outputs the notice signal E4 of the abnormalities in a dc-battery.
Drawing 11 is the timing chart which showed the interruption-of-service detection timing in the notice signal of the completion of charge and the power controller 210-1 when interruption of service occurs before the completion of charge of the dc-battery unit 214-5 in the power controller 210-1 of drawing 9. Supposing interruption of service occurs in the condition t0 which charge of the dc-battery unit 214-5 does not complete, i.e., the time of day which has the notice signal E30 of the completion of charge acquired through the counter 286 in the condition of L level, in drawing 11, Since DC electrical potential difference inputted by interruption of service in the middle of the charge over a dc-battery 298 falls if it is in the dc-battery unit 214-5 shown in drawing 10, the charging current decreases. The detection electrical potential difference by the charging current detector 290 falls, and if the detection electrical potential difference of the charging current turns into one or less reference voltage Vref, the completion detector 2112 of charge In spite of the fall of the detection electrical potential difference by

interruption of service, it is judged as what charge completed normally, and the notice signal E3 of the completion of charge is outputted through an interface circuitry 2110.
However, the notice signal E3 of the completion of charge from the dc-battery unit 214-5 is inputted into a counter 286, and after interruption of service occurred at time of day t0 in fixed time amount, for example, drawing 11, in the counter 286 and only the fixed time amount deltaT exceeding the time amount by the time of day t2 when interruption-of-service detection is performed is delayed by the power controller 210-1, it is inputted into the interface section 284 for dc-batteries of the power controller 210-1.
For this reason, since the microprocessor 260 prepared in the power controller 210-1 at time of day t2 is in L level the notice signal E30 of the completion of charge indicates it to be to charge un-complete at the time of this interruption-of-service detection even if DC output voltage of AC-DC converter 212-1 is less than reference voltage Vref2 through the interface section 278 for converters and interruption-of-service detection is performed, the dc-battery unit 214-5 can be judged [having not charge completed and].
The response of isolation and cutting authorization is returned in the disk storage module directed isolation of a disk storage module to the director 218-1 immediately, without waiting for progress of the backup time amount T1 guaranteed in the state of the completion of charge when the dc-battery unit 214-5 judged with charge un-completing, and the director 218-1 forbade registration of a new I/O demand, and already waited termination of the I/O process under reception. In response to this response, the power controller 210-1 will suspend actuation of AC-DC converter 212-1 and DC-DC converter 216-5, and will disconnect the power source of a director 218-1 and a disk storage module 248-1.
In addition, although DC-DC converter 216-5 and the dc-battery unit 214-5 of a disk storage module 248-1 were taken for the example if it was in the example of drawing 9, same processing is performed also to other disk storage modules 248-2 to 248-3 which the subordinate of the power controller 210-1 has, and powering off is performed also to a director 218-1.
Moreover, it was shown in drawing 4 and drawing 5 like the power controller 210-1, and also the power controller 110-2 of a network becomes completely the same.
Drawing 12 is the flow chart which showed the power control by the processor 260 prepared in the power controller 210-1 shown in drawing 9.
If the injection instruction of the system power from high order equipments, such as a service processor, is first distinguished at step S1 in drawing 12, Counter n is set to n= 1 at step S2, power-on is directed to one set of the beginning of the four sets of the DC-DC converters formed in four sets of disk storage modules 248-1 to 248-4, and the power-on of step S3 is repeated, incrementing [judge, and] whether Counter n amounted to n= 4 in step S4 at one step S5 with four [less than].
Thereby, four sets of the DC-DC converters which the subordinate of the power controller 210-1 has are started in order.
Then, it confirms whether it is equipped with the 1st dc-battery unit continuously referred to as n= 1 and specified at step S7 by step S6 n= 1, and if equipped normally, power-on will be directed to the 1st dc-battery unit set to n= 1 at step S6 by step S8. The discharge control signal E1 is sent out to the dc-battery unit which corresponds with these power-on directions, the discharge control switch 2100 shown in drawing 10 turns on, and a dc-battery unit will be in the condition which can be discharged.
Hereafter, processing of step S10, step S7, and step S8 is repeated until the power-on of the 4th dc-battery unit can be managed with step S9.
In addition, if it has not dc-battery equipped at step S7, it will progress to step S16, and alarm processing will be performed, for example, a system will be stopped.
If the power-on of four sets of dc-battery units ends by processing to step S9, the timer which determines a battery test period at step S11 will be started. Then, the existence of the deadline of a timer which determines a battery test period at step S12 is distinguished, and if it is before deadline, the interruption-of-service monitor distance of step S14 is repeated to deadline. If deadline is distinguished at step S12, it will progress to step S13 and battery test processing will be performed.
The battery test processing in step S13 is about the test switch 2104 formed in the dc-battery unit of

drawing 10. While turning on, the discharge control switch 2100 is turned off, it judges to fixed time amount discharge resistance 2106 and 2108 that the discharge current is [a dc-battery 298] unusual when a sink and the partial pressure electrical potential difference of the discharge resistance 2106 and 2108 at the time of fixed time amount progress are judged in the dc-battery malfunction detection circuit 2114 and it is below a predetermined electrical potential difference from a dc-battery 298, and the notice signal E4 of the abnormalities in a dc-battery is sent out to it from an interface circuitry 2110 to the power controller 210-1.

The interruption-of-service monitor processing in step S14 has the contents of processing shown in the subroutine of drawing 9.

In the flow chart of drawing 13, if the power controller 210-1 detects interruption of service at step S1 first, it will progress to step S2, and the notice signal E30 of the completion of charge acquired from the counter 286 at this time is read, and the existence of the completion of charge is judged at step S3. If it is the completion of charge, it will progress to step S4, and the 1st timer which carries out counting of the backup time amount T1 is started.

Then, the disconnect-request directions from a high order are checked at step S5, and deadline of the 1st timer is further checked at step S6.

When interruption of service has occurred, the computer-system side of a high order also progresses to step S7, without waiting for progress of the backup time amount T1 in this case, and advances a disconnect request from performing a disconnect request, after host system detects interruption of service and only fixed time amount continues an I/O demand to a subsystem to a director 218-1.

Moreover, if the deadline by progress of the backup time amount T1 by starting of the 1st timer is distinguished at step S6 even if there are no disconnect-request directions from a high order, it will progress to step S7 and a disconnect request will be performed to a director 218-1. Then, the 2nd timer which supervises the processing time T2 over a disconnect request at step S8 is started.

If the director 218-1 who received the disconnect request has, reception of a new I/O demand is forbidden and the I/O process under current reception is terminated to a disk storage module. After the I/O process of a disk storage module is completed, since a director 218-1 will be in isolation and a powering-off possible condition about a disk storage module, he answers cutting authorization to the power controller 210-1.

If the response of the cutting authorization from this director 218-1 is distinguished by step S9, it will progress to step S11, and actuation of the AC-DC converter and DC-DC converter which his subordinate has is suspended, and powering off is performed.

Moreover, when there is no response of cutting authorization from a director 218-1 at step S9, it is the case where abnormalities are in a disk storage module, and it waits for deadline of the setup time T2 of the 2nd timer at step S10 in this case, and comes to perform powering off at step S11.

Drawing 14 is other example block diagrams of this invention, if it was in one example of drawing 9, the notice signal E3 of the completion of charge from the dc-battery unit 214-5 was delayed by letting a counter 286 pass, but if it is in the example of drawing 14, set to a microprocessor 260 except for a counter 286. It is characterized by checking the notice signal of the completion of charge which read before beyond fixed time amount and was held at the time of interruption-of-service detection, and judging the existence of the completion of charge.

Namely, the microprocessor 260 of the power controller 210-1 reads the notice signal E3 of the completion of charge from the dc-battery unit 214-5 for every fixed period shown by the arrow head of drawing 16, and holds it by the term two or more rounds to RAM264.

If interruption of service occurs at time of day t0 by this condition, based on the charging current having fallen below to default value, the completion signal E3 of charge will serve as H level from the dc-battery unit 214-5 at time of day t1 by the fall of the supply voltage Vcc by interruption of service.

Then, if supply voltage Vcc is less than reference voltage Vref3, interruption-of-service detection will be performed in the power controller 210-1. As the notice signal E3 of the completion of charge at this time is shown in the timing of an arrow head 2118, it becomes with H level and the completion of charge is shown, but if it is to this invention, since the notice signal E3 of the completion of charge detected to the

last timing shown by the arrow head 2116 is read and judged, it is to L level and will be judged the notice signal E3 of the completion of charge in front of fixed time amount charge un-completing.
Drawing 16 is the flow chart which showed the subroutine of the interruption-of-service monitor processing by the microprocessor 260 prepared in the power controller of drawing 14, if interruption-of-service detection is performed at step S1, will lead the notice signal of the completion of charge currently before held to RAM64 beyond fixed time amount at step S2, and will judge the existence of the completion of charge at step S3.
For this reason, as shown in drawing 15, even if the notice signal of the completion of charge is accidentally sent out from the dc-battery unit before interruption-of-service detection, in order to judge the existence of the completion of charge from the notice signal of the completion of charge detected to the period in front of one It is judged with charge un-completing, it progresses to step S7, without waiting for the backup time amount T1 by starting of the 1st timer, and a disconnect request is immediately performed to a director 218-1, and it waits for the response of the cutting authorization from a director 218-1, and comes to perform powering off.
As explained above, according to the backup control at the time of interruption of service by this invention, even if the completion signal of charge is accidentally taken out from a dc-battery unit at the time of interruption of service, the charge condition of a dc-battery unit can be correctly grasped by the power controller side, the system abnormal termination and data corruption at the time of interruption of service can be certainly prevented by performing the backup process corresponding to a dc-battery charge condition, and the dependability of equipment can be raised.
Next, the backup control at the time of a power-source input halt by this invention is explained below. A conventional method and a conventional trouble are explained below before explanation of this invention.
Drawing 22 is what showed the outline of the conventional magnetic disk subsystem, a magnetic disk drive 3120 is formed to the high order equipments 3110, such as a host computer, and the magnetic-disk control section 318 and disk storage modules 348, such as a directory, are prepared in the magnetic disk drive 3120. Usually, two or more disk storage modules 348 are connected to pass from the magnetic-disk control section 318.
Drawing 23 is the system configuration Fig. having shown the conventional power-source backup method, mass Battery Unit 3150 can be connected between the power distribution facilities 3140 which input a power source into the high order equipment 3110 and the magnetic disk drive 3120 which were formed in the calculating-machine pin center,large 3130, and current supply can supply a power source to it from Battery Unit 3150 also in the time of a halt in a system.
As mentioned above, since mass Battery Unit independent of each equipment of a computer system was required of such a conventional backup method, while the excessive installation tooth space was needed, in order to back up AC power supply, it was disadvantageous also in respect of cost.
Moreover, Battery Unit and each equipment by the side of a system were independent structures, and since it was difficult to take a detailed interface among both, an efficient backup method was not able to be carried out.
That is, between Battery Unit and each equipment by the side of a system, although the Battery Unit side continued backup actuation although the system side was in the unnecessary condition about backup since it was difficult to check each other condition, or the system side had reached the limitation of backup of Battery Unit, system behavior may have been continued.
In order to solve this problem, it is necessary to build in the dc-battery for backup in the magnetic disk drive itself, and to perform I/O actuation also in the time of a halt of the input power of equipment, and when carrying out this backup actuation, it is necessary to solve the following troubles.
(1) In order to prevent unnecessary consumption of a dc-battery while continuing backup as much as possible after a magnetic disk drive detects interruption of service until the processing by the side of high order equipment is completed, when system behavior is completed, it is necessary to suspend backup actuation promptly.
(2) Even when only a magnetic disk drive detects interruption of service, while continuing a certain

amount of backup actuation, when the interruption of service more than an allowed value occurs, while a magnetic disk drive makes an I/O process [finishing / reception] complete from high order equipment, it is necessary to write in to the last, without interrupting the data under writing on a magnetic disk on the way.
(3) When backup time amount exceeds the allowed value of a dc-battery even if a certain abnormalities occur in a magnetic disk drive side and it cannot complete an I/O process after the magnetic disk drive detected interruption of service, in order to prevent too much consumption of a dc-battery, it is necessary to suspend backup actuation compulsorily.
(4) When input power is restored during backup actuation after the magnetic disk drive detected interruption of service, while suspending backup actuation, it is necessary to continue equipment actuation.
This invention aims at suitable backup control being made to be made to the magnetic disk drive itself to a halt of the power-source input at the time of preparing a dc-battery unit.
Drawing 19 is the principle explanatory view of the backup control by this invention.
This invention is the direct current voltage of the power supply unit (AC-DC converter) 312 which inputs an external power and is changed into predetermined direct current voltage, and a power supply unit 312 first. It is aimed at the magnetic disk drive equipped with the power supply section 300 having the dc-battery unit 314 which is charged and outputs the direct current voltage same at the time of interruption of service, the disk storage module 348 which operates in response to the current supply from a power supply section 300, the magnetic-disk control section (directory) 318 which controls a disk storage module 348 in response to the current supply from a power supply section 300, and the power control section (power controller) 310 which controls cutting from a power supply section 300 with powering on to a disk storage module 348 and the magnetic-disk control section 318.
If it is in this invention per such a magnetic disk drive, An interruption-of-service detection means 3102 to detect an input halt of an external power in the power control section 310, The 1st timer 3104 which produces a timer output when it starts at the time of interruption-of-service detection of the interruption-of-service detection means 3102, the stop time of a power-source input is supervised and the predetermined backup time amount T1 is reached, When the disconnect indication of a power source is received from high order equipment before the timer output of the 1st timer 3104 When powering-off processing of a disk storage module 348 and the magnetic-disk control section 318 is performed based on this disconnect indication, directions of powering off are not received from high order equipment and a timer output is obtained It is characterized by establishing the backup control means 3100 which performs powering-off processing of a disk storage module 348 and the magnetic-disk control section 318.
As powering-off processing of the disk storage module 348 by the backup control section 3100, and the magnetic-disk control section 318, a powering-off control signal is outputted to disk storage control 318 here, I/O actuation of the magnetic-disk section 348 is terminated, and when the notice signal of cutting authorization based on termination of I/O actuation is received from the magnetic-disk control section 318, the power source of the magnetic-disk section 348 and the magnetic-disk control section 318 is disconnected.
Furthermore, when it starts in the power control section 310 while outputting the powering-off control signal to the magnetic-disk control section 318 from the backup control section 3100, and termination of I/O actuation of a disk storage module 348 is supervised in it and it is reached in detail at predetermined time (T2), the 2nd timer 3106 which produces a timer output is formed. The backup control means 3100 disconnects the power source of a disk storage module 348 and the magnetic-disk control section 318 based on this notice of authorization, when the notice of authorization of powering off is received from disk storage control 318 before the timer output of the 2nd timer 3106. Moreover, when the notice of authorization of powering off is not received from disk storage control 318, and the timer output of the 2nd timer 3106 is obtained, the power source of a disk storage module 348 and the magnetic-disk control section 318 is disconnected.
Moreover, when restoration of a power-source input is detected after interruption-of-service detection,

by the clearance of the 1st timer 3104, the backup control means 3100 suspends backup actuation, and continues equipment actuation.
Moreover, when restoration of a power-source input is detected after starting of the 2nd timer 3106, the cutting actuation based on [while clearing] the notice of authorization of the disk control section 318 to powering off it is [cutting] the 2nd timer 3106 is forbidden, and equipment actuation is continued.
According to the magnetic disk drive of this invention equipped with such a configuration, an operation of following (1) - (4) is acquired.
(1) The power control section 310 of a magnetic disk drive starts the internal electrical power source supply by the dc-battery unit 314, when a halt of a power-source input is detected in the interruption-of-service detection means 3102. And the magnetic-disk control section 318 and a disk storage module 348 continue I/O actuation with high order equipment.
While high order equipment also performs interruption-of-service detection with a certain means, the I/O process is continued, when the constant value as which the power-source stop time was determined beforehand is reached, the I/O process which should be performed is completed and powering off is directed via a power control interface to a magnetic disk drive.
The power control section 310 of a magnetic disk drive in which powering off was directed disconnects the power source to the magnetic-disk control section 318 and a disk storage module 348, and suspends the backup actuation by the dc-battery unit 314.
(2) When a halt of a power-source input of only a magnetic disk drive is detected and powering off from high order equipment is not directed, the power control section 310 of a magnetic disk drive starts the 1st timer 3102 by interruption-of-service detection, supervises backup time amount, and when it exceeds fixed time amount T1 with backup time amount, it requires powering off from the magnetic-disk control section 318.
The magnetic-disk control section 318 which received the disconnect request of a power source stops registration of the new I/O process from high order equipment, makes the I/O process of the magnetic-disk section 348 which was receiving the time complete, and answers cutting authorization of a power source to the power control section 310.
The power control section 310 which received cutting authorization of a power source disconnects the current supply to the magnetic-disk control section 318 and a disk storage module 348, and suspends the backup actuation by the dc-battery unit 314.
(3) Although the power control section 310 required powering off of disk storage control 318, they are a certain abnormalities of the magnetic-disk control section 318 or a disk storage module 348, When not completing I/O actuation, or when authorization of powering off cannot be answered, when the power control section 310 supervises the response time with the 2nd timer 3106 started at the time of a disconnect request and exceeds a certain fixed time amount T2 from issue of a powering-off demand, it disconnects compulsorily the current supply to the magnetic-disk control section 318 and a disk storage module 348.
(4) When restoration of a power-source input is detected in the interruption-of-service detection means 3102 during implementation of the backup actuation by the dc-battery unit 314 before the 1st timer before the powering-off directions from high order equipment exceeded fixed time amount T1, the power control section 310 of a magnetic disk drive is clearing the 1st timer 3104 and suspending actuation, and makes equipment actuation continue.
Drawing 20 is the example block diagram of this invention, and is shown with AC-DC converter 312-1 and DC-DC converter 316-5 which the power controller 110-1 shown in drawing 4 and drawing 5 makes the controlled system, and the disk storage module 348-1 equipped with disk enclosure 336-1.
In drawing 20, a microprocessor 360 is formed in the power controller 310-1 as a power control means. The backup control section 3100 realized by program control, the interruption-of-service detecting element 3102, the 1st timer 3104, and the 2nd timer 3106 are formed in the microprocessor 360.
As the interface section [as opposed to RAM364, ROM366 and other power controllers 310-2 in the internal bus 362 pulled out from the microprocessor 360] 368, and a magnetic-disk control section It has the interface section 378 for converters to the interface section 374 for high orders to high order

equipments, such as the interface section 370 for directors to the ** director 318-1, the interface section 372 for panels to a maintenance panel 324-1, and a service processor (SVP), the interface section 376 for disks to a disk storage module 348-1, AC-DC converter 312-1, and DC-DC converter 316-5, and the interface section 384 for dc-batteries to the dc-battery unit 314-5.
The backup control at the time of interruption of service by the backup control section 3100 realized as a function of the microprocessor 360 of the power controller 310-1 comes to be shown in the flow chart of drawing 21.
It is as follows when the backup control by this invention is explained according to the flow chart of drawing 21.
(1) When the disconnect indication of a power source is received from the above-mentioned equipment;
A halt of AC input to the magnetic disk drive of this invention performs interruption-of-service detection, as the supply voltage incorporated through the interface section 378 for converters is shown in step S1 of drawing 21 in the interruption-of-service detecting element 3102 prepared in the microprocessor 360, when it falls to specified voltage.
Here, when AC input stops, the DC29V [same] are outputted from the dc-battery unit 314-5 which suited the charge condition till then in response to the fact that DC29V from AC-DC converter 312-1, and it will be in a backup condition.
If interruption-of-service detection is performed at step S1, the 1st timer 3104 will be started at step S2, and the elapsed time from interruption-of-service detection supervises whether the predetermined backup time amount T1 guaranteed based on the capacity of the dc-battery unit 314-5 is reached.
On the other hand, when interruption of service has occurred in interruption of service and coincidence of a magnetic disk drive at the high order equipment side, while a certain means performs interruption-of-service detection also in high order equipment, an I/O process is continued, the I/O process which should be performed when fixed time amount which the power-source stop time defined beforehand is reached is completed, and powering off is directed through the interface section 374 for high orders to the power controller 310-1 of a magnetic disk drive.
If directions of the powering-off demand besides from equipment are distinguished at step S3 of drawing 21 and a disconnect request is received, the backup control section 3100 of a processor 360 will progress to step S5, will send out a powering-off control signal to a director 318, will perform a disconnect request, and will start the 2nd timer 3106 at step S6 to coincidence.
If the director 318-1 who received the powering-off demand from the power controller 310-1 has, the processing in the disk storage module 348-1 of the I/O process which stopped reception of the new I/O process from high order equipment, and was receiving the time is made to complete and the notice of completion is received from a disk storage module 348-1, the response notice of the authorization of powering off will be given at the backup control section 3100 of a processor 360 through the interface section 370 for directors of the power controller 310-1.
The authorization response from this director 318-1 is distinguished at step S7, progresses to step S9, suspends actuation of DC-DC converter 316-5 built in AC-DC converter 312-1 and the disk storage module 348-1 through the interface section 378 for converters, and disconnects current supply.
(2) When interruption of service occurs in a magnetic disk drive side;
In this case, directions of the disconnect request of a power source are not performed from high order equipment. For this reason, if interruption-of-service detection is performed at step S1, reach the backup time amount T1 which started the 1st timer 3104 and was beforehand defined at step S2. When it distinguishes having passed the deadline of by step S4, it progresses to step S5, the disconnect request of a power source is performed to a director 318-1, reception of the new I/O process from high order equipment is stopped, and the processing in magnetic-disk MOJIRU 348-1 of the I/O process which was being received till then to coincidence is made to complete.
Moreover, the 2nd timer 3106 is started at step S6 following the disconnect request to the director 318-1 of step S5.
If the authorization response of powering off will be performed from a director 318-1 to the power controller 310 if completion of an I/O process can be normally managed with a director 318-1 side, and

this authorization response is distinguished at step S7, actuation of AC-DC converter 312-1 and DC-DC converter 316-5 will be suspended by step S9, and a power source will be disconnected.
(3) Although powering off was required of the director 318-1 from the power controller 310, when I/O actuation was not completed by abnormalities or the authorization response of powering off is not completed;
The 2nd timer 3106 started at step S6 when I/O actuation was not completed by a certain abnormalities of a director 318-1 or a disk storage module 348-1, or when the authorization response of powering off was not completed even if I/O actuation was completed although powering off was required of the director 318-1 at step S5 also in the above (1) and any of (2) The authorization response time to the disconnect request of the power source performed to the director 318-1 is supervised, when it distinguishes having reached and passed the deadline of to the predetermined time T2 defined beforehand at step S8, even if there is no response of the cutting authorization from a director 318-1, it progresses to step S9, and actuation of a converter is suspended, and a power source is disconnected.
(4) When a power-source input is restored after interruption of service;
By the middle of interruption-of-service detection performing backup actuation in the power controller 310 of a magnetic disk drive, as shown in the above (1) or (2) When restoration of a power-source input is detected in the interruption-of-service detecting element 3102 before receiving demand directions of powering off, or before the 1st timer 3104 started by interruption-of-service detection reached the predetermined backup time amount T1, the backup control by the backup control section 3100 is compulsorily interrupted for clearing the 1st timer and suspending actuation, and a magnetic disk drive is operated continuously.
Moreover, a disconnect request is performed to a director 318-1 at step S5, And after starting the 2nd timer 3106 at step S6, before receiving the authorization response of powering off from a director 318-1, or when restoration of a power-source input is detected by the interruption-of-service detecting element 3102 before the 2nd timer 3104 reached fixed time amount T2 While clearing the 2nd timer 3106 and suspending actuation, even if it receives the authorization response of powering off from a director 318-1 after that, converter actuation is not suspended, but equipment actuation is made to continue.
Halt processing of the backup actuation based on such power-source restoration detection will be compulsorily performed by interrupt processing to the flow chart of drawing 21.
In addition, although the example of drawing 20 is shown as a control load on behalf of AC-DC converter 312-1, DC-DC converter 316-5, and the dc-battery unit 314-5, same backup control will be performed to each unit shown in drawing 4 which the subordinate of the power controller 310-1 has in fact. This point is the same also about the power controller 310-2 side.
Moreover, although the program control of a microprocessor 360 has realized the interruption-of-service detecting element 3102, the 1st timer 3104, and the 2nd timer 3106 if it is in the example of drawing 20, you may connect with the internal bus 362 of a microprocessor 360 as firmware of dedication.
Since the interior of a magnetic disk drive is equipped with the dc-battery unit according to the backup control by this invention as explained above, mass Battery Unit for the whole computer system becomes unnecessary, and an installation tooth space can reduce sharply and can hold down the cost of a dc-battery to necessary minimum.
Moreover, the interior action and system behavior of a magnetic disk drive are guaranteed as much as possible at the time of interruption of service, backup time amount is suppressed so that degradation of a dc-battery may be prevented to coincidence, and efficient power-source backup can be realized.
Next, the starting approach of the magnetic disc system by this invention is explained below. Before explanation of this invention, the conventional method and its trouble are explained below.
Although what is necessary is to start one set at a time in order, and just to go as the starting approach of suppressing the rush current, conventionally with the magnetic disk subsystem carrying two or more disk storage modules, the starting time amount to starting termination becomes long. Then, there is an approach which starts two or more disk storage modules at a time in order for every group part opium poppy and group.
16 disk storage modules are carried now, as shown in drawing 30, 2A takes the warm-up time for 30

seconds to the disk starting current per set, and it presupposes that the stationary current after the completion of starting was 0.5A.
Drawing 31 is the timing diagram which showed the conventional starting approach and conventional sum total current by group division.
16 sets of four disk storage modules are first divided into each group #1-#4. And if four sets of group #1 of the beginning are started, group #2-#4 which follow whenever predetermined time deltaT [from which the rush current serves as max immediately after starting], and deltaT= 2 seconds pass will be started in order.
In this case, although the completion time amount of starting is as short as 36 seconds, its maximum of a sum total current increases with 32A.
What is necessary is just to start in order to lower the rush current further to the starting approach of drawing 31, while only the warm-up time for 30 seconds shifts group #1-#4, as shown in drawing 32. In this case, although the completion time amount of starting is as long as 240 seconds, the maximum of the rush current can be held down in 16A and one half.
However, if it was in the starting approach of such a conventional magnetic disk drive, it rose, when it started so that the maximum of the rush current might become large, a power supply could not be reduced, if warm-up time is shortened, and a power supply might be stopped, and there was an opposite problem that time amount became long.
This invention aims at the starting control which rises at the same time it suppresses the starting current, and can also shorten time amount.
Drawing 24 is the principle explanatory view of the starting approach by this invention.
First, as shown in drawing 24 (A), in case this invention switches on and starts the power source of two or more disk storage modules, it is characterized by dividing two or more disk storage modules into two or more groups of the same number, changing a time interval for every group, and starting in order.
Each group shifts and does sequential starting only of the time amount (deltaT) to which the maximum rush current immediately after starting flows at least here. Moreover, only the time amount (deltaT) to which the rush current immediately after starting flows shifts the first two groups like drawing 24 (A), and sequential starting is carried out, and it repeats successively so that starting of the group who follows after the completion of starting of the group who started to the 2nd may not be overlapped.
Moreover, you may make it repeat the processing which only the time amount (deltaT) to which the rush current immediately after starting flows shifts two groups like drawing 24 (B), carries out sequential starting, and carries out sequential starting of the following two groups similarly after the completion of starting of the group who started to the 2nd.
Moreover, as shown in drawing 24 (C), the starting approach of this invention divides two or more disk storage modules into two or more groups of the number which is mutually different, shifts a fixed time interval for every group in order of a group with much number, and starts in order.
In this case, by abbreviation one half of warm-up time, each group is shifted one by one and started.
Moreover, this invention is characterized by changing the time interval which divides two or more disk storage modules into two or more groups of the number which is mutually different, and starts them for every group, and starting it in order.
Also in this case, only the time amount (deltaT) to which the rush current immediately after starting flows at least is shifted, and sequential starting of each group is carried out. Moreover, only the time amount (deltaT) to which the rush current immediately after starting flows is shifted, sequential starting of the two groups is carried out, and the processing which carries out sequential starting of the following two groups similarly after the completion of starting of the group who started to the 2nd is repeated.
According to the starting approach of the magnetic disk drive of this invention by such procedure, the maximum of the rush current under starting is held down by changing starting spacing between groups, and a power supply can be made small.
Moreover, warm-up time can be shortened by changing the number in a group, without making the rush current increase so much.
Furthermore, by changing starting spacing between groups and changing the number in a group, the

maximum of the rush current can be held down and warm-up time can be shortened to coincidence.
Drawing 25 is the timing diagram which showed the starting approach of one example of this invention, and it is characterized by dividing 16 sets of four disk storage modules into each four groups of group #1-#4, if it is in this one example, changing each group's time interval, and making it start in order.
In drawing 25, group #1 of the beginning is first started at time of day t1. Thereby, sum total current 8A is produced. Next, four sets of group #2 are started at the time of day t2 after the fixed time amount deltaT= 2-second progress to which the maximum of the rush current immediately after starting flows.
In this condition, since there are eight sets in activation status, a sum total current increases to 16A.
If warm-up time 30 seconds pass from the time of day t1 started first, four sets of startings of group #1 will be completed, it becomes the 4th set of stationary current 2A, and if it doubles with group #2, it will fall in a total of ten A.
Then, group #2 go through the warm-up time for 30 seconds, and they start the following four sets of group #3 at the time of day t3 which carries out starting termination. At this time of day t3, since group #2, starting termination of #3, and starting are performed to coincidence, the sum total current of 12A which added starting current 8A of group #3 to a total of eight-set of the stationary currents 4A of group #1 and #2 flows.
Group #3 pass for 30 seconds, and if it is in the time of day t3 which carries out starting termination, the following group #4 are started. If it is in time of day t4, it becomes the sum total current of 14A because four-set of the starting currents 8A of newly started group #4 joins 12-set of the stationary currents 6A of group #1-#3. If starting of group #4 is finally completed at time of day t5, it will settle in 8A which is the total value of the stationary current for 16 sets.
If it is in the starting approach of this drawing 25, the warm-up time from time of day t1 to time of day t5 is 92 seconds, and the maximum of the sum total current under starting is set to 16A, and becomes 16A and half to starting current maximum 32A of the conventional approach shown in drawing 32. On the other hand, warm-up time is short at 92 seconds and below one half compared with 240 seconds of the conventional approach of maximum current 16A indicated to be 92 seconds to drawing 32 to 36 seconds although it was long.
Drawing 26 is the timing diagram which showed other examples of this invention, and serves as a modification of the example of drawing 25.
namely, -- if it is in the example of drawing 25 -- deltaT= -- after the completion of starting of group #2 after shifting for 2 seconds and starting group #1 and #2 -- group #3 and # -- although it has started so that it may not overlap for every four If it is in the example of drawing 26, it is characterized by detaching deltaT= 2 seconds and making it start similarly like group #1 of the beginning, and the case of #2 about group #3 and #4.
Although the maximum of a sum total current becomes large with 20A if it is in the example of this drawing 26, warm-up time can be shortened to 64 seconds and 2/3.
if drawing 27 is the timing chart which showed the example of further others of this invention and is in this example -- 16 sets of disk storage modules -- group #1 -- six sets and group #2 -- three sets and group #3 -- five sets and group #4 -- two sets -- as -- the number is changed for every group and it becomes sequence from a group with much number with the one half for each group's warm-up time 30 seconds -- shift by a unit of 15 second It is characterized by carrying out sequential starting at fixed spacing.
If it is in the example of this drawing 27, the maximum of the rush current under starting is 19A, and the warm-up time from time of day t1 to t5 can be managed in 75 seconds, and is effective from the example of drawing 25 about warm-up time, and is made about the maximum of the rush current fewer than the example of drawing 26.
Drawing 28 is the timing diagram which showed the example of further others of invention, and it is characterized by this example combining the example of drawing 25, and the example of drawing 27. That is, while dividing 16 sets of disk storage modules into four groups, the number of group #1, #2, #3, and #4 is changed with six sets, three sets, five sets, and two sets. Furthermore, about starting of group #1 and #2, it shifted for deltaT= 2 seconds, and started, and when starting of group #2 is completed,

similarly, group #3 and #4 were shifted for deltaT= 2 seconds, and they are started.
If it is in the example of this drawing 28, the maximum of the rush current under starting is set to 18.5A, and becomes 66 seconds to t5 from time of day t1. Therefore, compared with the example of drawing 25 - drawing 27, it turns out that the example of drawing 28 is the most advantageous in respect of the maximum of the rush current, and warm-up time.
Drawing 29 is a flow chart for realizing starting control of this invention shown in drawing 25 performed by the power controller 110-1,110-2 - drawing 28.
In drawing 29, if the powering-on instruction of a disk storage module is first received from high order equipment to a power controller, it will progress to step S2 and group number X of a disk storage module will be inputted. For example, group number X inputs four groups of X= 4. Then, it progresses to step S3, the counter n which shows the group number is set to n= 1, and the number of the disk storage module assigned to each group by processing of step S4-S6 is inputted.
That is, the number of the disk storage module contained in the 1st group set up by step S4 n= 1 is inputted, one counter n is incremented at step S5, and it judges whether the value of Counter n reached group number X at step S6, and processing of S4-S6 is repeated until it reaches setting group number X. For example, in the case of X= 4 group, A3 base is inputted into A2 set and the 3rd group, and A4 base is inputted into the 1st group in the 4th group at A1 set and the 2nd group.
Then, after setting Counter n to n= 1 at step S7, the time interval for every group is inputted at steps S8-S10.
That is, the time amount Tn from the n-th group set up with the value of the counter n at that time at step S8 to the n+1 next group is inputted, one counter n is incremented by step S9, and processing of step S8 is repeated until Counter n reaches group number X at step S10. T-four time amount is inputted into the 1st group at the 2nd group, and is inputted into the 3rd group by this for T 2 hours for T 1 hour at T3 time amount and the 4th group.
If the number input for every above group and the input of a time interval end, it will progress to step S11, and Counter n is again set to n= 1, and starting processing is performed in steps S12-S15.
That is, a powering-on signal is sent out to the n-th group at this time carried out counter n ****** at step S12, and it judges whether Counter n was in agreement with group number X at step S13, and if not in agreement, even the time amount Tn already inputted at step S14 is counted with a timer, it progresses to step S15 by count termination, one counter n is incremented, and powering on to the next group is again performed at step S12. After all groups' powering on ends, Counter n completes an injection in accordance with group number X at step S13.
Based on each example of drawing 25 - drawing 28, the number of the disk storage modules for every group inputted by step S4 of the flow chart of this drawing 29 and S8 and the time interval Tn of the injection for every group are prepared for RAM etc. as table data, in the case of powering-on control, they can input this table data and starting control can be carried out.
In addition, although the case where the above-mentioned example divided 16 sets of disk storage modules into four groups, and starting control was carried out was taken for the example, the number and group number of a disk storage module can be defined suitably if needed.
Moreover, time amount deltaT which the peak value of the rush current produces, and the warm-up time for 30 seconds do not become settled suitably according to a disk storage module, either, and it is not limited to the example of this invention.
the case where according to the starting approach of the magnetic disk drive by this invention carry out the group division of two or more disk storage modules, and starting control is carried out as explained above -- starting spacing between groups -- and -- or, by changing the number included in a group, while holding down the maximum of the rush current under starting, starting time amount from starting initiation to termination can be shortened as much as possible.
Next, the power-source monitor by this invention is explained below. The conventional monitor method is explained below before explanation of this invention.
Drawing 40 is the block diagram of the power supply section of a magnetic disk drive. That is, it is the block diagram of two power supply sections which have a common dc-battery. The power controllers 1

and 2 are power control among drawing. Power supply units A, B, and a are each power supply units, and the dc-battery units A and B, 0 and 1, and a and b are dc-batteries which accompany each power supply unit. Like illustration, Dc-battery O and 1 are dc-batteries common to the power controllers 0 and 1. In such a configuration, in order to include in a system (magnetic disk drive), the monitor of a dc-battery is performed.

Drawing 41 is the monitor and inclusion timing chart of the conventional dc-battery. M1, M2, and M3 show the monitor time of a dc-battery among drawing, and the ready signal of each dc-battery having an usable dc-battery, and having started in the incorporable condition to a system is shown ("H" in drawing). Moreover, the thick wire on a ready signal shows the condition that the dc-battery was built into the system.

Like illustration, conventionally, the monitor spacing M1-M3 of a dc-battery is fixed, the dc-battery 1 has started by M1 at the monitor time, the dc-battery 1 is already built into the system by M2 at the monitor time, a dc-battery 2 is in an incorporable condition, and a dc-battery 3 is not [a ready signal does not start ("L" in drawing), and] in the condition which can be backed up.

And when it patrols, according to the condition of the dc-battery in this monitor timing, it is included in a system. For example, even if a dc-battery 3 will be in the condition which can be backed up just behind M2 at the monitor time, as a thick wire shows, it is shown that a system is not incorporated to M3 at the monitor time. In addition, M1 means the patrol just behind powering on at the monitor time.

By the way, by the above-mentioned conventional method, the trial of the dc-battery function is performed by actually consuming the target dc-battery power source. Therefore, the common dc-battery was supervised by coincidence from two lines (namely, power controllers 0 and 1 of drawing 40), and when carried out by carrying out fixed time amount continuation of the monitor of a parenthesis, it had the problem of being in the defect of a dc-battery own [that] or a backup improper condition.

Moreover, by the time a dc-battery is possible from a backup improper condition, the predetermined charging time will be needed, and on the other hand, this charging time is different with a dc-battery. Therefore, in order to judge as a dc-battery which can back up by the monitor, it is necessary to check that it is a normal dc-battery at once, and the problem that the stage (namely, inclusion to the system show by the thick wire) within equipment which can be start to use will be overdue surely occurs under the monitor of only fixed spacing as show by M1, M2, and M3 of drawing 41.

This invention aims at being made to perform inclusion to the system of a dc-battery quickly by preparing a monitor time in timely and controlling the contention from two lines.

In the common power-source supervisory equipment in the power supply unit which this invention has the dc-battery which accompanies two or more each, for example, two lines, at a power supply unit and this, and is common in an other system, and the system which has a dc-battery, Between the power controller 0 of one system, and the power controller 1 of the system of another side, the signal and dc-battery monitor under dc-battery monitor actuation are equipped with the patrol control means PC which gives priority. It is characterized by supervising the function of the dc-battery which accompanies a common power source, and facing including in a system, and controlling the coincidence monitor of a dc-battery, and the inclusion timing to the system of a dc-battery.

Here, timely, power control supervises the ready state of a dc-battery, shortly after detecting that it is in the ready state which can back up a dc-battery, monitor actuation of the dc-battery concerned is started, and if the dc-battery function is appropriate, it will perform inclusion to the system of the dc-battery concerned.

moreover, the near power control with which power control sends out the master signal MAS which shows that when self-equipment supervises to a patrol control means, and the patrol control means has not received the master signal -- receiving -- an other system -- a dc-battery monitor -- the other-system patrol signal (O-TST) which shows a working thing is sent out.

When performing dc-battery monitor actuation establishes mutually the signal which can be judged, it prevents that a monitoring function operates to coincidence between one system and other systems, and the completion signal of charge is always checked to the dc-battery of a backup improper condition, a monitoring function is carried out quickly, and it enables it to detect the condition which can be backed

up in this invention.
Drawing 33 is the principle block diagram of the dc-battery monitor by this invention, and shows the configuration of two power units which have a dc-battery. Like illustration, Dc-battery O and 1 are dc-batteries common to the power controllers 0 and 1. Furthermore, in this invention, the patrol control means PC which controls the monitor timing between the power controllers 0 and 1 is established about the common dc-battery units 0 and 1. MAS is a master signal and this example shows that the power controller 0 side is patrolling the common dc-battery. O-TST is an other-system patrol signal, and when this signal is high-level, it is shown that the other system is patrolling. Each of these signals is inputted into the patrol control means PC from the power controllers 0 and 1, and in a patrol control means, patrol initiation is directed to one side from control and priority of patrol indication time amount so that it may mention later.
Drawing 34 is the signal timing explanatory view of a dc-battery patrol. As mentioned above, O-TST is a signal which shows that the other system is patrolling, and B-TST is a patrol indication signal to a dc-battery. Thus, by controlling other-system patrol signal O-TST by the patrol control means PC, the patrol of an other system can be inhibited and the continuous patrol to a common dc-battery can be prevented. In addition, B-ALM is a dc-battery alarm signal, and shows the limitation of dc-battery patrol time amount like illustration. If dc-battery patrol time amount passes, it becomes charge guarantee time amount and this time amount can be taken till the period when other-system patrol signal O-TST is high-level. That is, the period when other-system patrol signal O-TST is high-level is because the patrol from one system is inhibited. Therefore, progress of a high-level period can make this other-system patrol signal O-TST the time amount which guarantees patrol spacing in a system.
Drawing 35 is the dc-battery monitor and inclusion timing chart of this invention. Like drawing 41, it is M1, M2, and -- at the monitor time, and the thick wire on a ready signal shows the condition of having been included in the system. Moreover, "L" of a ready signal shows a backup improper condition (namely, under charge), and "H" shows the condition which can be backed up. After patrolling by M1 at the monitor time and including only dc-battery BTU-1 in a system, in this invention, the patrol of a fixed time interval like before is not performed, but sequential operation of the monitor of only the ready signal of dc-battery BTU-2 and BTU-3 is carried out.
That is, shortly after detecting ON ("H") of a ready signal, it is made to include in a system, as shown in M4 at the monitor time, and it patrols a dc-battery 2 immediately, and a thick wire shows, if it is in a backup usable condition. Similarly, also about a dc-battery 3, shortly after detecting "H" of a ready signal, if a dc-battery is in a backup usable condition, as shown in M4 at the monitor time, and it patrols immediately, and a thick wire shows, it is incorporated in a system. In addition, M1 is immediately after power-source ON at the monitor time, M2 is after [from M1] fixed time amount at the monitor time at the monitor time, and M3 is after fixed time amount from M2 at the monitor time at the monitor time. Moreover, M4 is immediately after detection about "H" of a ready signal at the monitor time, and M5 is after fixed time amount from M4 at the monitor time at the monitor time. Thus, since a dc-battery is patrolled shortly after carrying out sequential operation only of the ready signal in this invention and detecting ON of a ready signal, inclusion to the system of a dc-battery can be carried out quickly.
Drawing 36 is the signal timing chart of the dc-battery patrol at the time of contention by this invention. This Fig. shows the patrol control approach in two lines. As mentioned above, MAS is a master signal and it is shown that the side which has become ON (H), i.e., high level, patrols. O-TST is an other-system patrol signal, and it is shown that the side this signal of whose is high level patrols. B-TST is a dc-battery patrol indication signal, and when high-level, performing the dc-battery patrol is shown.
a time -- ** -- being shown -- as -- zero -- a system -- one -- a system -- coincidence -- timing -- it is not -- a case -- being fixed -- a sequence -- taking -- although -- a time -- ** -- being shown -- as -- coincidence -- a patrol -- it was going to start -- the time -- or -- ** -- being shown -- as -- an other system -- already -- activation -- inside -- it is -- a case -- it was going to start -- the time -- the following -- explaining -- as -- controlling . This control is performed by the power controllers 0 and 1.
When starting a patrol, first, other-system patrol signal O-TST detects "yes" and a "low", and it checks that the patrol is not performed by the other system. When an other system is performing by ON, other-

system patrol signal O-TST sets up the time amount which an other system ends, and already shifts patrol start time. This shows by "withdrawal" in drawing.
On the other hand, when a both system tends to start a patrol to coincidence, a system with low priority is made to make other-system patrol signal O-TST OFF, i.e., a low, and the system with priority starts a patrol, after waiting for other-system patrol signal O-TST to turn off.
Drawing 37 - drawing 39 are the procedure flow charts of the power-source supervisory equipment of this invention. Poor wearing is reported, if initiation of a dc-battery patrol is directed (S1), and whether it is equipped with the dc-battery judges first (S2) and it is not equipped (S3). If equipped, the dc-battery itself will judge next whether they are abnormalities, and if it is (S4) and abnormalities, the abnormalities in a dc-battery will be reported (S5). Next, the ready signal of a dc-battery judges high (1) or low (0) (S6), and if it judged whether it would be over 4 hours next if it is a low (S7) and has exceeded, the abnormalities in charge will be reported (S8). If it is not over 4 hours, the monitor of a ready signal is continued (S9).
In step S6, if a ready signal is a high, a dc-battery ready flag is set (S10), it will judge whether it is the first flag (S11), 2 hours will be set, and the first flag will be reset (S12). Next, it judges whether it is over 2 hours (S13), if it has not exceeded, it stands by, but if it has exceeded, other-system patrol signal O-TST judges whether it is a high (S14), and if it has exceeded, a delay timer will be set and it will stand by (S15).
O-TST -- yes -- if it does not come out -- this -- setting (S16) -- again -- O-TST -- high ****** -- judging (S17) -- yes, if it does not come out, it judges whether fixed time amount has passed (S18).
In step 18, if fixed time amount has passed, a battery test will be performed (S19), If it has judged and (S20) passed [whether fixed time amount has passed and], O-TST will be reset (S21), and it judges whether there is any error in a patrol (S22), if there is an error, the error of a patrol will be reported (S23), if there is nothing, a dc-battery will be registered (S24), and a timer is initialized for 2 hours and it ends (S25).
On the other hand, when O-TST is a high in step S17, a master signal is judged (S26), if there is no master signal, O-TST will be reset (S27), and a delay timer is set and it stands by (S28). A battery test will be performed if the timer was initialized (S29) and it judged whether it was an excess of time amount, when it was a master signal (S30), and time amount excess is carried out (S19).
As explained above, according to the power-source monitor by this invention, in a dc-battery patrol, transition in the backup improper condition by prevention of the defect judging by malfunction of a dc-battery and the abnormality consumption by continuation patrol can be prevented by preventing the concurrency control of the common dc-battery by one system and the system of another side.
Next, the power-source change-over control by this invention is explained below. The conventional configuration is explained below before explanation of this invention.
Drawing 45 is the block diagram of two power units which have the conventional common dc-battery. The power controller 0 is equipped with the dc-battery unit controlled by firmware, a power supply unit, and a converter controller. It has a configuration with the same said of the power controller 1.
In such a configuration, when, as for the conventional power control sequence, ON directions of the power source of zero system are performed the power controller 0 side, the power controller 0 performs injection directions of a power source in order of the power supply unit 00 ->02 -> converter controller 00 ->02 -> dc-battery unit 00->02 based on the sequence beforehand specified by firmware with directions of a dc-battery unit control circuit, a power supply unit control circuit, and a power controller. On the other hand, it is carried out like [one system] zero system the power controller 1 side, and the power controller 1 performs injection directions of a power source in order of the power supply unit 10 ->12 -> converter controller 10 ->02 -> dc-battery unit 10->12. Therefore, the circuitry for receiving control from the power control of the both system of 0/1 system is needed, and the converter controller 02 becomes circuitry from which only zero system was different in the converter controllers 00 and 10 of only one system.
With the above-mentioned conventional configuration, as mentioned above, the KOMPATA controller 2 has circuitry for receiving control from the power controller of a both system, and will become

complicated circuitry from which only zero system was different in the converter controllers 00 and 10 of only one system. And since a common design cannot be performed, a limit is in components communalization, and it has become the cause of a cost rise.
moreover, the case where the dc-battery unit 02 of zero system is normal, and the dc-battery unit 12 of one system is an abnormal condition -- ****** -- even if interruption of service of short time amount occurs, since one system has the unusual dc-battery unit 12, it is not regarded as the condition which can be backed up, but although the dc-battery unit 02 is normal, one system will be in the power-source OFF state of a system, and will become piece system employment of the power controller 0.
Furthermore, when equipment with a common power source was backed up like illustration, the configuration which connects a dc-battery to each ** was taken. Therefore, in an intersection, it will have a dc-battery in a duplex (in drawing, they are the dc-battery units 02 and 12), and there was a problem that a mounting tooth space became large.
Furthermore, when it had a common dc-battery, by having two power control, a battery test will be performed to coincidence by power-source ON, it was detected with the poor dc-battery, or the dc-battery was exhausted beyond the need, and degradation of a dc-battery had become early.
In this invention, it communalizes at a time by one piece respectively, without forming the power source and dc-battery of a common power source for each system of every, the cross control circuit which switches and controls connection between these, a power source, and a dc-battery is prepared among both power control, and reduction of a power source and dc-batteries is aimed at. Therefore, it aims at preparing the address selection circuit which sets up whether communalization and reduction of components are performed and which dc-battery is tested, and preventing contention of a battery test.
In this invention, it has the dc-battery unit which accompanies a power supply unit and a power supply unit at two or more each, for example, two lines. And it sets to the power unit in the magnetic disk drive which has the power supply unit which is common in an other system, and the accompanying dc-battery. Between the power controller 0 of one system, and the power controller 1 of the system of another side It has the cross control means X which carries out cross control of the connection with common power source and dc-battery, and has an address selection means AD to set up the address which shows self equipment, in each power control. While it was chosen switches the account cross control means X based on the address of a system. Therefore, it is characterized by having the configuration which communalized the common power supply unit and the accompanying dc-battery to the both system. And the battery test and the monitor are made to be performed by the address selection of the own system by the address selection circuit only from one system.
In this invention, the cross control circuit X is formed between the power control of a both system. Therefore, it prevented changing battery test start time respectively and performing a battery test to coincidence from two lines by enabling control of a power supply unit 02 and the dc-battery unit 02 in common from the power controllers 0 and 1, setting to one the dc-battery to the system which has by this the power source which receives common control, a converter controller, current supply, etc., performing fraction-izing of components, and communalization, and giving an address selection means further to a both system.
Drawing 42 is the principle block diagram of the power-source change-over control by this invention. The power controller 0 is equipped with the dc-battery unit controlled by firmware, a power supply unit, and a converter controller, and is equipped with the address selection circuit AD which controls the battery test of the coincidence from two more lines. It has a configuration with the same said of the power controller 1.
Moreover, the power control circuit of a both system and the cross control circuit X which switches connection between common power sources are formed separately.
Although power supply units 02 and 12 and the dc-battery units 02 and 12 were required for this invention with the conventional configuration of drawing 45, it is communalized by this invention with one each of a power supply unit 02 and the dc-battery unit 02, so that clearly [in such a configuration]. In order to enable such a configuration, it becomes controllable through the cross control circuit X connected to the both system of the power controllers 0 and 1.

And power-source ON directions are directed to a power supply unit 02 and the dc-battery unit 02 by the power-source ON directions from the power controller 0 or one side of 1. Moreover, power-source OFF directions are performed to each power supply unit 02 and the dc-battery unit 02 by publishing power-source OFF directions from both power controllers 0 and 1. Moreover, the condition of the dc-battery unit 02 can be grasped through a cross control circuit from both both power controllers 0 and 1.
By such configuration, all control of a power supply unit, a converter controller, and a dc-battery unit becomes the same, and the formation of a common design and common components-ization of it are attained.
Drawing 43 is the one example block diagram of the cross control circuit shown in drawing 42. Like illustration, the cross control circuit X consists of three OR GETA OR1, OR2, and OR3, and the signal of a both system is inputted into the input of each OR gate. Therefore, an ON signal will be outputted if one input is ON. For example, if the dc-battery unit 02 has ON directions from either power controller 0 system or one system, the dc-battery unit 02 is turned on. Since the same is said of others, explanation is omitted.
Drawing 44 is the battery test initiation flow chart of this invention, and shows the setting flow chart of a timer value especially. Contention can be made to prevent by giving the address to each of the power controllers 0 and 1, making firmware read the address on the occasion of contention of the battery test at the time of power-source ON, and initializing a timer so that this may be different by the power controllers 0 and 1 in the time amount which starts a battery test.
In drawing 44, if initiation of a battery test is directed (S1), the address judges the power controller 0 or 1 (S3), further, it judges whether the power source is turned on (S2), if it is the power controller 0, a timer will be set for M seconds, and if it is (S4) and the power controller 1, a timer will be set for N second (S5). Next, if it judged whether the timer would be over this setup time (S6) and has exceeded about each of M seconds of power controller 0 system, and N second of power controller 1 system, a battery test will be performed (S7) and a predetermined test will be ended (S8). Here, it considers as M<<N.
As explained above, according to the powering-off control by this invention, by enabling cross control of a dc-battery, the number of arrangement per system of a dc-battery can be decreased, and contraction-ization of a system configuration can be attained, and common design-ization of a power supply section can be attained. Furthermore, since the simultaneous operation of a battery test is avoidable, battery life improves, since common components look the same from every system, the dc-battery condition of a system can grasp correctly, and the reliability at the time of backup improves remarkably.
Next, the analysis of the powering-off factor by this invention is explained below. A conventional configuration and a conventional trouble are explained before explanation of this invention.
Drawing 48 is the conventional current supply and the basic block diagram of cutting control, and drawing 49 is the flow chart of the powering-off control system in the drawing 48 configuration. In drawing 48, disk storage control 720 is typically divided into the power supply section 721 and the function part 722, in order to simplify explanation. Therefore, a power supply unit and a dc-battery unit are contained in the power supply section 721 of the drawing 48 configuration, and other configurations are included in a function part 722. The 1st storage 723 is storage which records the hysteresis of failure generating, such as a halt of a system of operation. In addition, IF is a power control interface between high order equipment 710 and disk storage control 720, AC is AC power supply, and DC is DC power supply. Moreover, although drawing 49 explains, RS is a powering-off demand signal sent out from a power supply section 721, and AS is a powering-off enabling signal sent out from a function part 722.
In drawing 49, from the high order equipments 710, such as a host computer, by actuation of an operator, if a power supply section 721 receives detection of interruption of service, and directions of powering off through the power control interface IF (S1), first, a power supply section 721 will switch the current supply to a function part 722 to a dc-battery from a power supply unit (S2), and a power supply section 721 will do fixed time amount maintenance of this dc-battery output (S3). That is, at the time of interruption of service, it is constituted by the dc-battery for backup so that only fixed time amount can hold the power source of a system. Next, a power supply section 721 sends out the

powering-off demand signal RS to a function part 722, and notifies the purport which wants to disconnect a power source.
A function part 722 will perform predetermined processings for carrying out powering off, such as preparation of powering off, if this powering-off demand signal RS is received (S5). And it tells predetermined processing or that the powering-off enabling signal AS may be sent out to a power supply section 721 after ending (S6), and a power source may be disconnected to a power supply section 721.
If a power supply section 721 obtains this powering-off enabling signal AS, it judged first whether the powering-off enabling signal AS would be obtained (S7) and this signal AS is received, it will perform processing which disconnects a power source (S8), and powering-off processing will end it. Moreover, in step S7, if Signal AS is not received from a function part 722 yet, the judgment of this step is repeated and is performed.
Thus, if a power supply section 721 switches the power source which will be supplied if interruption of service is detected to a dc-battery and does fixed time amount progress, it will cut a dc-battery automatically through the same procedure as having received the usual powering-off directions. And the dc-battery used in the following power up is charged, and it prepares for the next interruption of service.
By the way, as mentioned above, it is only recording the hysteresis of failure generating and, as for the 1st storage in the conventional configuration, powering off etc. is not recording the hysteresis of a power-source operating condition for a halt of system behavior etc. Therefore, there were the following problems.
** When a power source is in a cutting condition by interruption of service, neither high order equipment nor an operator can be notified of by what kind of factor it was cut.
** When a dc-battery is in a charge condition by the next powering on, don't know why it is in a charge condition.
** The degradation stage of a dc-battery cannot be expected. Therefore, the exchange stage of a dc-battery is not known.
****
This invention aims at analyzing the factor of powering off easily.
Drawing 46 is the principle block diagram of the analysis of the powering-off factor by this invention.
In the powering-off control unit in the file C-system which consists of this inventions with high order equipment, a magnetic disk drive, and the disk storage control formed among these The power supply section 721 is equipped with the power supply unit which supplies a power source to each drive module, and the dc-battery unit which backs up a power source at the time of interruption of service. On the other hand, besides the 1st storage 723 which records hysteresis, such as failure generating, on function part 722' It has the 2nd store 724 which takes the log of a power-source operating condition. The backup signal BS which shows the purport which used the dc-battery for backup by interruption of service when the power source of a system disconnects a power supply section The automatic-disconnect signal CS which shows the purport that progress of the maximum charging time value cut the power source automatically after switching to a dc-battery is sent out to a function part. If the powering-off demand signal RS is sent out from , next a power supply section to a function part and a function part receives a powering-off demand signal The powering-off enabling signal AS is sent out to a power supply section after the predetermined processing including preparation of powering off, and the 2nd store of a function part carries out the log of a backup signal and the automatic-disconnect signal, when a powering-off demand signal is received. The 2nd store is referred to. Therefore, it is characterized by judging power-source operating conditions, such as the last powering off, to the following power up.
Here, when notifying the purport which carried out powering off automatically after progress of the maximum charging time value of a dc-battery, the automatic-disconnect signal CS can be set as a low level high-level, when powering off is compulsorily carried out before progress of the maximum charging time value.
Moreover, the 2nd storage can use a part of memory area of the 1st storage, and the 1st and 2nd storage can use a hard disk further.
The backup signal which notifies the purport which used the dc-battery from interruption of service

from a power supply section in this invention, Before sending out a powering-off demand signal for the automatic-disconnect signal which notifies the purport that the power source was disconnected automatically since fixed time amount (the maximum charging time value of a dc-battery) passed after switching to a dc-battery, it sends out to a function part, a function part establishes the 2nd storage means which records a power-source operating condition, and it is in carrying out the log of these signals to the 2nd storage means. Therefore, the operating condition of a power source and the factor of powering off are easily analyzable by referring to this 2nd storage means before the next powering on. In addition, the 2nd storage means can use some memory areas of the 1st storage means, without preparing separately, and a hard disk can be used for it.

Drawing 47 is the procedure flow chart of the drawing 46 configuration. The same reference number is given to the same component as drawing 46 among drawing. In this invention, a power-source halt etc. has formed the 2nd storage 724 for recording the hysteresis of a power-source operating condition in function part 722'. In addition, BS is a battery-back-up signal from a power supply section 721, and CS is an automatic-disconnect signal from a power supply section 721.

In drawing 47, like the above-mentioned, from the high order equipments 710, such as a host computer, if a power supply section 721 receives detection of interruption of service, and directions of powering off through the power control interface IF (S1), first, a power supply section 721 will switch the current supply to function part 722' to a dc-battery from a power supply unit (S2), and a power supply section 721 will do fixed time amount maintenance of this dc-battery output by actuation of an operator, (S3). That is, at the time of interruption of service, it is constituted by the dc-battery for backup so that only fixed time amount can hold the power source of a system. Next, since the power supply section 721 reached the maximum charging time value of the backup signal BS and a dc-battery which notifies the purport which is using the dc-battery by interruption of service to function part 722', it sends out the automatic-disconnect signal CS which notifies the purport which wants to disconnect a power source automatically. And a power supply section 721 sends out the powering-off demand signal RS to function part 722' next.

If the powering-off demand signal RS is received, function part 722' will perform predetermined processings, such as preparation of powering off, (S6), next will carry out the log of the backup signal BS and the automatic-disconnect signal CS to the 2nd storage 724 (it memorizes). And the powering-off enabling signal AS is sent out to a power supply section 721 as the log to the 2nd storage 724 was completed (S8). If the power supply section 721 judged whether the powering-off enabling signal AS would be obtained and Signal AS is received, the dc-battery output which was being used until now will be cut (S10), and powering-off processing will be ended (S11). In addition, in any case, it is memorizable to the 2nd storage 724 by making the automatic-disconnect signal CS high-level, in disconnecting a power source automatically as mentioned above, since the maximum charging time value of a dc-battery passed, and making the above-mentioned automatic-disconnect signal CS into a low level, in disconnecting a power source compulsorily during dc-battery use.

As explained above, when it collects by establishing the 2nd storage means which carries out the log of the backup signals and automatic-disconnect signals like this invention, and these signals, and referring to this 2nd storage means after that, there is the following effectiveness.

** Turn out whether the dc-battery was used at the time of powering off.

** Decision of being what the power supply section cut automatically by interruption of service can be performed.

** When a dc-battery is in a charge condition at a power up, by what used the dc-battery by the last powering off, what carried out self-discharge by that it is charge or degradation can be known, and it can be followed as the guide of exchange of a dc-battery.

** By investigating the count of the maximum discharge of a dc-battery, degradation of a dc-battery can be expected and can be made into the standard of exchange.

Next, the power-source maintenance display means by this invention is explained. The basic configuration of a system is explained before explanation of this invention.

Drawing 52 is the basic block diagram of a file C-system, and is the important section block diagram of

disk storage control especially. As mentioned above, disk storage control consists of a power supply section 821 and a function part 822 fundamentally, and the power supply section 821 consists of a power supply unit which changes alternating voltage into direct current voltage, and is supplied to a function part, and a dc-battery unit which backs up at the time of interruption of service. Moreover, the function part 822 consists of drive modules which are not mainly illustrated. IF is a power control interface between high order equipment 810 and a power supply section 821 among drawing, RS is a powering-off demand signal sent out to a function part from a power supply section at the time of dc-battery use, and AS is a powering-off enabling signal sent out to a power supply section from a function part, when a powering-off demand signal is received.
In such a file C-system, at the time of starting of a system, it bundles up from high order equipment from remoteness to all units by the operator, and injection and cutting of a power source are usually performed so that it may explain below. On the other hand, at the time of maintenance check of a system, powering off can be performed now for each unit of every.
Drawing 53 is the important section block diagram of the power-source circumference of the system of drawing 52. the inside of drawing, and 811 -- above -- the power control interface between high order equipment 810 and a power supply section -- it is -- 812 -- remoteness (REMOTE) -- being individual (LOCAL) -- it is the R/L switch to switch and 813 is the power control section which performs injection and cutting of a power source, 814 is a power-source maintenance panel which has arranged various switches, and 815 is an equipment front panel which has arranged the various switches for systems.
C1 is a power-on signal from the power control interface 811 among drawing, and C2 is a power-on signal from a power-source maintenance panel. C3 is a R/L signal from the R/L switch 812, and C4 is a power-on signal. Signals C3 and C4 are inputted into the power control section 813, and send out the powering-on indication signal C5 to a power supply section 821. Consequently, a power supply section 821 can supply a power source to a function part 822. In addition, D1 is a data bus for the data sent out to panels 14 and 15 from the power control section 13.
In this case, when directing powering on from high order equipment 810, the R/L switch 812 needs to be on the "REMOTE" side, and on the other hand, when directing powering on according to a unit individual, it is necessary to make the R/L switch 812 into the "LOCAL" side.
Drawing 54 is the important section block diagram of the conventional power-source maintenance panel. Like illustration, "REMOTE", the R/L switch which switches "LOCAL", and the ON / off switch from which a power source is switched on and disconnected are formed. Usually, the R/L switch is on the "REMOTE" side and powering on from remoteness has come to be able to do it collectively to all units. And a R/L switch is made into the "LOCAL" side at the time of the maintenance check according to individual, and powering off according to individual is performed.
Drawing 55 is the flow chart of the conventional maintenance procedure. As mentioned above, powering on and cutting to equipment are usually performed through the power control interface 811 from high order equipment 810. That is, the R/L switch 812 is on the "REMOTE" side, and is performing injection/cutting of a power source with power-source ON / off-switch. Therefore, an operator can switch on and disconnect the power source of the equipment concerned from a remote location.
On the other hand, when starting the maintenance service of equipment, (S1) and a maintenance worker switch a R/L switch to the "LOCAL" side (S2), and are once disconnecting the power source with power-source ON / off-switch (S3). This is for preventing that a power source is accidentally supplied to the equipment concerned from remoteness at the time of a maintenance service. And after the maintenance service was carried out and (S4) and a predetermined maintenance service were completed, the power source of equipment was switched on with power-source ON / off-switch (S5), and while normal judges in no (S6) and operating normally, it disconnected the power source of equipment, the start of equipment switched the R/L switch to the "REMOTE" side, returned it to the normal state, and has ended the maintenance service (S8).
Like the above-mentioned step S8, the maintenance worker is the procedure which switches a R/L switch to the "REMOTE" side at the time of termination of a maintenance service. However, a maintenance worker may forget this procedure, and a maintenance service may be ended while the R/L

switch has been the "LOCAL" side. Therefore, since the R/L switch was not on the "REMOTE" side, there was a problem that powering on was not made only to the equipment concerned, at the time of the next powering on from remoteness.
This invention aims at enabling it to prevent a failure of a R/L switch to switch certainly at the time of termination of a maintenance service.
Drawing 50 is the important section block diagram of the power-source maintenance panel by this invention. It sets to the disk storage control in a file controller system, and this invention is on the power-source maintenance panel of a system. Be manually operated at the time of a maintenance service, or mind a power control interface from high order equipment. Power-source ON / off-switch which performs powering on and cutting The side in which remoteness to powering on and cutting are possible (REMOTE), The R/L switch which switches the side (LOCAL) in which powering on and cutting are possible according to an individual, It has a display means to display the condition of said R/L switch. At the time of the maintenance service of equipment After making said R/L switch into the "LOCAL" side, it is characterized by what said power-source ON / off-switch performs powering off, and said R/L switch is made into the "REMOTE" side after termination of a maintenance service, and is displayed on said display means.
In this invention, it is warned that it is made into the "REMOTE" side to a maintenance worker by displaying this condition on the above-mentioned display means at the time of the "LOCAL" side by forming the display means which shows the condition of a R/L switch in a power-source maintenance panel, and the power control section 813 establishing the condition of a R/L switch, i.e., a means by which the "REMOTE" side or "LOCAL" side is detectable.
Drawing 51 is the procedure flow chart of the maintenance service of this invention. Step S 1-6 are the same as usual of drawing 55. That is, when starting the maintenance service of equipment, (S1) and a maintenance worker switch the R/L switch of a power-source maintenance panel to the "LOCAL" side (S2), and are once disconnecting the power source with power-source ON / off-switch (S3). And after a maintenance service is carried out and (S4) and a predetermined maintenance service are completed, the power source of equipment is switched on with power-source ON / off-switch (S5), and the start of equipment judges whether it is normal (S6). And in step S5, the purport which switched on the power source of equipment with power-source ON / off-switch is displayed on the display means of a power-source maintenance panel in code (S7).
If a maintenance operator can check that equipment has started normally in step S6, he will disconnect the power source of equipment, will switch a R/L switch to the "REMOTE" side (S8), will check the display of a power-source maintenance panel further, and will end (S9) and a maintenance service (S10).

In this case, when the power control section 813 shown in drawing 53 judges the condition of the R/L switch 812 and it changes into the "LOCAL" condition, that is displayed on a display means, it gets to know that a maintenance worker is still in the "LOCAL" condition, and a R/L switch is switched to the "REMOTE" condition. The internal power control section 813 directs code designation for a display means, if it detects having changed into the "REMOTE" condition. In addition, when having switched to for example, the "REMOTE" condition and the methods of presentation in a display means are still "00" and the "LOCAL" condition, they are good by suitable approaches, such as being referred to as "11."
Drawing 56 is the appearance perspective view of the magnetic disk drive which applied this invention. The result of the procedure explained by drawing 51 is displayed on the display means of the power-source maintenance panel 814 shown in drawing 50. Moreover, a power-source maintenance panel is prepared in the upper part of the front panel of drawing 56.
As explained above, according to the maintenance-panel display by this invention, the condition of a R/L switch can reduce an activity mistake by that of my ** at a glance at the time of termination of a maintenance service. Moreover, when the injection of the power source from high order equipment is not completed, the cause which cannot carry out powering on can become clear immediately, and the maintenance time can be reduced.
Availability on industry In the magnetic disk drive used as a subsystem of the medium size computer

system used for office etc., by this invention, the dc-battery for backup is separately formed in the director section and a disk storage module according to a network, and it was made to carry out supply control of the power source according to the operating state of each director section. Therefore, the dc-battery for backup can be miniaturized, thereby, a miniaturization and the magnetic disk drive with which densification was carried out and it was satisfied of Fire Service Law can be offered, and the availability on industry is expanded sharply.

[Translation done.]